Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

In this issue~

D B

P. O. F. I. LIBRARY

JUL 29 1959

FISH & WILDLIFE SERVICE

- Flying Depth Recorder — P. 3
- Hydraulic Lift Deck — P. 3
- Antibiotic Ice — P. 9
- Salt Fish Research — P. 11
- Fish Meal Manufacture — P. 13

~ and 27 others

Vol. 12 No. 5 May 1959

Fish and Wildlife Service
U. S. Department of the Interior
Washington D. C.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FRED A. SEATON, SECRETARY

FISH AND WILDLIFE SERVICE
ARNIE J. SUOMELA, COMMISSIONER

Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

EDITORIAL STAFF of the BRANCH OF TECHNOLOGY

F. Bruce Sanford, Editor
Kathryn L. Osterhaug, Associate Editor
Martin J. Heerdt, Assistant Editor
June H. Olden, Assistant Editor
Gladys K. Chandler, Editorial Clerk (Typist)
Maurice E. Stansby, Editorial and Technical Consultant

Applications for COMMERCIAL FISHERIES ABSTRACTS, which is mailed free to members of the fishery industries and allied interests, should be addressed to the Director, Bureau of Commercial Fisheries, United States Department of the Interior, Washington, 25, D.C.

Fulfillment of foreign requests confined to Government agencies, research institutions, and libraries.

This journal is comprised of abstracts prepared from articles originally published in more than 70 other journals from all parts of the world. The article from which an abstract is prepared is not necessarily found in its original journal of publication, but may have been reprinted from still another journal. Most of the material published in Commercial Fisheries Abstracts reports work done in laboratories that are not connected with the Bureau of Commercial Fisheries.

THE BUREAU CAN ASSUME NO RESPONSIBILITY FOR THE ACCURACY OF MATERIAL FROM OUTSIDE SOURCES AND CAN FULFILL REQUESTS FOR COPIES OF ARTICLES ONLY IF THE ABSTRACT WAS TAKEN FROM A BUREAU PUBLICATION. READERS SHOULD DIRECT REQUESTS FOR REPRINTS TO THE AUTHOR OF THE ARTICLE OR TO THE PUBLICATION IN WHICH IT APPEARED. THE ADDRESSES OF THESE PUBLICATIONS ARE AVAILABLE FROM THE BUREAU OF COMMERCIAL FISHERIES, WASHINGTON 25, D. C.

The abstracts in this leaflet may be left in their present form; but it is suggested that to make the most efficient use of them, they be cut on the lines designated and filed by the number in the upper left-hand corner of each. For a full description of this filing system see "Fishery Technological Abstract Card System" by Maurice E. Stansby and K. L. Osterhaug, Fishery Leaflet No. 232, obtainable free by request from Bureau of Commercial Fisheries, Washington 25, D. C.

Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical
1 Fish by species
2 Fresh fish
3 Preserved fish
4 Oils
5 Vitamins
6 Fishery byproducts
7 Analytical Methods
8 Composition
9 Miscellaneous

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.33 SPECTRAL REFLECTANCE STUDIES OF THE HEME PIGMENTS IN TUNA FISH FLESH, SOME CHARACTERISTICS OF THE PIGMENTS AND DISCOLORATION OF TUNA MEAT

Naughton, John J.; Zeitlin, Harry; and Frodyma, Michael M. (University of Hawaii, Honolulu, T. H.)
Journal of Agriculture and Food Chemistry 6, 933-938 (December 1958)

During investigations into the nature and causes of "greening" in certain yellowfin tuna during precooking, characteristics and reactions of heme pigments were revealed. The method of spectral reflectance was used because its use made possible the study of the normal and abnormal pigments of protein in raw and in cooked flesh.

Experimental.--Yellowfin tuna were caught by long-line from U. S. Bureau of Commercial Fisheries research vessels in the central equatorial Pacific and by trolling in local waters. Long-lining produced large fish from 70 to 200 pounds, which were frozen on board as soon as possible. Trolling produced smaller fish up to 15 pounds, which were sampled while fresh.

Precooked samples were obtained by putting the frozen fish through the regular commercial cooking process of a local canner and were graded for color by the canner's food technologist. Specific samples that were characteristic of their types (normal, green, or pink) were used in much of the work.

To prepare the samples for reflectance measurements, the authors forced tuna flesh through 16-mesh stainless steel screen and packed it into a 1¼- by 1/16-inch aluminum planchet. Chemical reagents were added to the meat in the planchet. A glass plate was pressed firmly upon the meat until the surface was smooth in order to obtain a diffuse surface and to eliminate gloss or directional color.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

0.38 ALGINASE IN THE SEA URCHIN STRONGYLOCENTROTUS PURPURATUS

Eppley, Richard W. (University of Southern California, Los Angeles)
Science 129, 214-215 (January 23, 1959)

Introduction.--Alginase may be a common digestive enzyme in invertebrates that feed upon brown algae. Alginase has been noted in intestinal extracts of an abalone, Haliotus giganteus; a sea urchin, Sphaerechinus pulcherissima; and a sea hare, Aplysia punctata. The alginase from abalone, like that of certain bacteria, appears to hydrolyze algin to free mannuronic acid after a period of incubation. By analogy with pectic-acid hydrolysis by pectin-polygalacturonase, the alginase from invertebrates may be termed algin-polymannuronase. The presence of an alginase in marine animals and the production of alginase by marine micro-organisms may have considerable ecological significance in the economy of the intertidal and subtidal zones.

Purpose.--Because brown algae make up a large portion of the diet of sea urchins, the authors examined Sphaerechinus purpuratus (1) for the existence of an alginase and (2) to determine if this alginase is active at the reported pH of the gut of the sea urchin.

Experimental.--Crude enzyme preparations were obtained from (a) whole gut plus gut contents; (b) the gut wall, washed five times with sterile sea water; (c) the liquid contents of the gut; and (d) the solid contents of the gut, which were mostly coralline red algae. The filtered liquid contents of the gut were used directly. The other preparations, before use, were ground in a mortar with cold 0.5M tris buffer (tris-hydroxymethylaminomethane) at pH 7.5 and were filtered first through Whatman No. 1 and then through Whatman No. 42 filter papers. These preparations were mixed with approximately 0.1 percent of sodium alginate, and subsequent changes in viscosity were followed by means of a rolling ball viscosimeter. A decrease in viscosity was evidence of the digestion of the algin.

For a determination of the effect of pH on enzyme activity, tissues were ground in distilled water, filtered as before, and mixed with alginate made up in the appropriate buffer. Correction was made

(over)

 ABSTRACTER: Martin Heerdt

0.33 A NEW REACTION OF ALDOSES WITH PRIMARY AMINES AND ITS SIGNIFICANCE FOR NON-ENZYMIC BROWNING REACTIONS

Anet, E. F. L. J. (Division of Food Preservation and Transport, C.S.I.R.O., Homebush, N.S.W., Australia)
Chemistry and Industry No. 44, 1438-1439 (November 1, 1958)

Aldoses are known to react rapidly and reversibly with primary and secondary aliphatic amines, including amino acids, to yield glycosylamines, which undergo the Amadori rearrangement slowly and irreversibly to give N-substituted-1-amino-1-deoxyketoses. These reactions are generally accepted as being the first steps in the "Maillard reaction" or nonenzymic browning of amines with aldoses; the nature of subsequent reactions is still obscure. However, in the case of an aminodeoxyketose derived from a primary amine, the nitrogen atom is secondary and should react with one more molecule of aldose in the above way. Thus glycine reacts with D-glucose to yield N-(carboxymethyl)-1-amino-1-deoxy-D-fructose (hereafter referred to as D-fructose-glycine) which then should react with further D-glucose to yield N:N-di-(D-arabino-3:4:5:6-tetrahydroxy-2-oxo-hexyl)-glycine (hereafter referred to as di-D-fructose-glycine). Such a reaction has not previously been observed but di-D-fructose-amino acids (compounds Fa) were detected but not recognized as such by Anet and Renolds (1957) among the byproducts of the reaction of D-glucose with amino acids. Also the compounds F1a and F4a found by them in extracts from browned fruit were probably di-D-fructose-L-aspartic acid and di-D-fructose-L-asparagine.

Di-D-fructose-glycine was prepared by heating at 100° C. as a concentrated syrup either of the following mixtures: (a) glycine as the sodium salt with excess D-glucose or D-mannose for 12 minutes, or (b) D-fructose-glycine as the sodium salt with D-glucose or D-mannose for 6 to 7 minutes. The di-D-fructose-glycine was separated by ion-exchange chromatography, the yield of crystalline

(over)

 Reprinted in part

1.017 AUSTRALIA'S GROWING TUNA FISHERY

Sardone, L. T.
Canadian Fisherman 45, 37, 38 (December 1958)

Tuna-fishing area.--The 11 species of tuna found in Australian waters, in the order of their present commercial importance, are (1) southern bluefin tuna, (2) striped tuna, (3) northern bluefin tuna, (4) yellowfin tuna, (5) albacore tuna, (6) Australian bonito, (7) mackerel tuna, (8) frigate mackerel, (9) leaping bonito, (10) oriental bonito, and (11) dogtooth tuna.

Two of the six well-defined tuna-fishing areas around Australia are of commercial importance at the present time. One of the commercial areas extends from the midcoast of New South Wales, along the eastern coast of Victoria, across Bass Strait, and down to the island of Tasmania. This area produces southern bluefin, albacore, mackerel tuna, frigate mackerel, and Australian and leaping bonito.

The other commercial area extends along the coast of South Australia, across the Great Australian Bight to the south coast of Western Australian. This area also produced several species of tuna.

Gear.--Pole fishing was introduced to local Australian fishermen during 1956 by Sverre and Chris Jangaard of San Diego, California, who were making a 3-month survey of these waters. They found the Australian tuna to be chunkier than those caught off California and, therefore, to give a better yield.

Southern bluefin are taken by pole and line with live bait and by trolling. Limited amounts of

(over)

 ABSTRACTER: Kathryn L. Osterhaug

GREENING OF TUNA

NONENZYMIC BROWNING

ALGINASE IN SEA URCHIN

AUSTRALIAN TUNA

0.33

product was up to 20 percent of the glycine from (a) and 40 percent of the D-fructose-glycine from (b). Lower temperatures could also be used with increased reaction times. The final pH in methods (a) and (b) was about 8; at a lower pH the yields were much smaller due to the increasingly slower rate of formation and the higher rate of decomposition. Di-D-fructose-glycine was easily recrystallized as colorless plates, m.p. 111.5 to 112° C., $[\alpha]_D^{25}$ −78°, which consumed 8 moles of periodate giving crystalline tri(carboxymethyl)amine. D-Galactose and D-xylose gave the corresponding amorphous compounds; di-D-tagatose-glycine and di-D-threopentulose-glycine. When glycine was replaced by other amino acids or a simple amine such as ethylamine the products could not be crystallized. The course of these reactions is easily followed by paper electrophoresis in acid buffer; nonionic compounds, diketose-amine, ketose-amine and the amine being well separated from each other.

In aqueous solution diketose-amines decompose spontaneously to ketose-amines. Di-D-fructose-glycine gave an apparently quantitative yield of crystalline D-fructose-glycine. This formation of ketose-amine was followed quantitatively by paper electrophoresis. The times for 50 percent decomposition of di-D-fructose-glycine at pH 5.5 at 25°, 40°, 50°, 75° and 100° C. were 6 days, 16 hours, 6 hours, 22 minutes and 2 minutes, respectively. These rates were 5 to 2 times slower at pH 3.5 and 6 to 10 times slower at pH 8. Diketose-amines derived from other amines and other aldohexoses behaved similarly, but those derived from pentoses yielded much less stable compounds.

The fate of the remainder of the diketose-amine molecule is not clear. No glucose, fructose or 5-(hydroxymethyl)furfural (λ max. 285 mμ) were detected from the decomposition of di-D-fructose-glycine. Instead other carbonyl compounds (λ max. 232 mμ), some probably unsaturated, were formed but were converted in part to 5-(hydroxymethyl) furfural by heating for 1 hour at 100° C. with 0.03N acetic acid. These compounds, unlike sugars, have reactive carbonyl groups and could therefore undergo aldol polymerizations more readily.

Several mechanisms have been suggested for the conversion of fructose-amino acids to brown polymers. Gottschalk and Partridge (1950) saw the reaction as proceeding, at least in acid solution, through 5-(hydroxymethyl) furfural or at its Schiff's base. Hodge proposed a mechanism involving amino-reductones in the presence of amine salts in alkaline media. Hurd and Buess (1956) on the other hand suggested self aldol condensations eventually leading to brown polyketones.

1.017 (Cross Reference: 1.12)

this species also have been taken with lampara nets. Striped tuna are taken by troll line and by pole and line with live bait. Pilchard as well as anchovies are suitable for live bait and are available in the area. Northern bluefin very seldom are trolled but are taken by beach seine when they school close to the beaches. Albacore are taken exclusively by trolling. In the area near the north coast of Australia, prolonged calms during the winter months enable the use of seine nets.

Fishing craft.--Approximately 15 vessels in Australia are equipped for fishing tuna with live bait. The largest vessel is 128 feet in length with a beam of 22 feet 6 inches and a molded depth of 10 feet 9 inches. The vessel, which formerly was a luxury tourist craft, now is provided with five refrigerated wells on each side of the vessel, with a total capacity of 30 tons. Accommodations are provided for a crew of 14.

The development of a tuna fishery necessarily is bound up with and limited by the economics of cannery operations. The Australian Commonwealth Government has set aside funds to be used for helping the commercial development of the tuna industry.

0.33 (Cross Reference: 3.331)

The prepared sample immediately was introduced into the reflectance attachment of the spectrophotometer. The relative reflectance was measured by comparison with a pure high-fired alumina disk that also was covered with a glass plate. Absorbance (optical density) was used in plotting the curves, as Beer's law was obeyed in the systems studied.

Experimental findings.--The work reported in this paper is based on the assumption that the pigments in tuna flesh consist of hemoglobin or its derivatives. Examination of raw tuna by means of spectral reflectance seemed to indicate that oxy- and methemoglobin were the principal heme pigments present.

Experimental results indicate that the pigment systems in tuna meat are extremely susceptible to environmental changes. During frozen storage, the oxyhemoglobin is converted to methemoglobin, which results in discoloration of the meat.

Examination of the spectral reflectance curves of raw tuna reveals that some degree of denaturation of heme pigment takes place even at low temperatures. There is some indication that the degree of denaturation is directly related to the amount of methemoglobin originally present in the flesh.

Methemoglobin unexpectedly was found to be considerably more soluble in water than is oxyhemoglobin. This suggests that pigment leaching during thawing and precooking may be a factor in producing a washed-out condition in tuna. This finding might also be applied as a means of lightening the color of tuna meat.

Greening is an actual color condition caused by the abnormal oxidation of heme protein. Factors that are related to greening include high concentrations of methemoglobin, some denaturation of the protein, and a higher-than-normal peroxide content of the fat in the raw flesh.

0.38

for a difference in the initial algin viscosity, which is especially marked in McIlvaine's buffers, and enzyme digestion did not exceed 4 hours' duration. Potassium oxalate, at a final concentration of 0.03 percent, was added to the gut liquid and the gut solid extracts to eliminate the effects of calcium salts from the coralline red algae on the viscosity of the algin solutions. This amount of oxalate, when added to extracts low in calcium, was without effect on enzyme activity.

The method of Somogyi-Nelson was used to test for reducing sugar produced during the 4-hour period of digestion. The naphthoresorcinol test for mannuronic acid was applied to aliquots of the digest after precipitation of polyuronides with 10 percent calcium chloride solution.

Results.--All of the extracts appeared to contain an enzyme or enzymes capable of digesting algin, but an increase in reducing sugar or the presence of calcium-soluble, naphthoresorcinol-positive products could not be demonstrated. The only indication of digestion was a marked decrease in the viscosity of the initial algin. The gut wall was less active than were the liquid content of the gut, the gut solid extracts, or the combined gut contents and gut wall. The most rapid digestion of algin occurred with a lyophilized gut-wall- plus-gut-contents preparation. This extract decreased the viscosity of the polysaccharide by more than one-half in $7\frac{1}{2}$ minutes.

Conclusions.--Different pH activity curves obtained for the alginase of the gut wall and of the gut contents, respectively, suggest that two alginases may be involved. Because the gut content of this animal is known to contain micro-organisms capable of degrading whole brown algal blades, these micro-organisms may be a source of the alginase in the gut. Precursors of alginase in the gut wall also could contribute to the alginase found in the content of the gut. Clarification of the role of intestinal bacteria in algin digestion by Strongylocentrotus purpuratus is needed. Also of interest would be (1) a characterization of the products of algin digestion by these preparations and (2) a determination of their usefulness to the sea urchin.

2.116 HOW A "FLYING DEPTH RECORDER" SPEEDS FISH-FINDING PATROLS

Anonymous
The Fish Boat 3, 27 (November 1958)

Using a combination of an ultrasonic depth recorder, a streamlined float, and a helicopter, Russian scientists have developed an efficient method for locating schools of herring, anchovies, and the larger tunny or horse mackerel. The aerial ultrasonic sounding method has proved to be faster and more accurate than have either visual or acoustical surveys made with instruments located aboard a fishing vessel.

The aerial-acoustical method is quite simple. The helicopter is made to hover approximately 50 feet above the water level of the area being surveyed for fish. The sound projector, or microphone, is lowered into the water on a wire. Thirteen to twenty feet above the microphone a buoyant streamlined float is attached by wire. The wire from the float leads up to the helicopter, where it is wound on the drum of a small winch with its terminal attached to the acoustical depth-sounding instrument. The float and microphone are towed over the area at speeds that range up to 10 miles per hour while a technician at the instrument panel watches the tracings sent up from the microphone and recorded on tape. The velocity of the ultrasonic signals indicates (1) the dimensions of the fish schools, (2) their depths, and (3) the species of fish in the school.

Using a radiotelephone, the technician relays the information to fishing boats in the area. In addition to guiding the boats to the schools of fish, the information tells the fisherman the amount and type of fish below the surface and thus enables him to prepare the proper trawl or seine gear for the fish he expects to catch.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

2.117 APPLICATION OF REFRIGERATED SEA WATER FISH HOLDING TO A SMALL COMBINATION FISHING VESSEL

Roach, S. W. and Harrison, J. S. M. (Fisheries Technological Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 112, 3-6 (December 1958)

Introduction.--The Ruth G II is primarily a 45-foot steel salmon troller that was built to include refrigerated sea-water tanks for troll-caught salmon. In 1958, this vessel operated successfully as a salmon seiner and fish packer.

Purpose.--This article has been prepared to show by example (1) how refrigerated sea-water holding can be incorporated into a vessel with little hindrance to its main function of catching fish and (2) how the problems associated with the application of sea-water holding can be solved.

Design of vessel.--The Ruth G II will hold 17,000 pounds of fish in three tanks arranged in a row across the vessel amidship. This load would normally account for the total capacity of a 45-foot vessel; however, an additional 30,000 pounds can be carried in the conventional hold behind the tanks. Much of this capacity results (1) from the saving of space achieved by the use of steel construction and (2) from the modern trend in naval architecture to provide additional beam. The use of three tanks permits three different conditions of loading without ballasting with another tank; namely, (1) center tank full only, (2) side tanks full only, or (3) all tanks full. Three tanks also cut the free surface area of the water to a point where the vessel can be operated in moderate seas with one tank partly filled.

With this arrangement, the tank section usually is short enough so that the main shaft bearings are located outside of the tank area. Provision can be made for shaft removal if the center tank is raised or tunnelled. By proper selection of the width of the center tank, provision also can be made for engine removal without disturbing the side tanks. This arrangement, in conjunction with

(over)

 ABSTRACTER: Martin Heerdt

2.117 TIME, LABOR SAVING LIFT-DECK RAISES PROFITS, CUTS ACCIDENTS

Anonymous
The Fish Boat 3, 25-27 (December 1958)

A hydraulic lift-deck designed to clear trash off the working area of the deck was installed a year ago on the Dartmouth, an 85-foot New Bedford scalloper. After a full year of use, the equipment is reported to be an unqualified success.

Simply described, the deck tilts up on hydraulic pistons, and at the same time, the vessel's bulwark swings outward. Trash that remains on the deck after the scallops have been sorted slides back into the water without any manual labor.

In addition to the time and labor saved by the hydraulic deck, many accidents have been prevented. The advantages of the installation may be summarized as follows: (1) By decreasing labor time, the new deck cut 2 days from the Dartmouth's average trip. It is estimated that the deck has contributed to a production increase of about 30 percent. (2) By preventing accidents so that no insurance claims were filed for a period of 1 year, the protection and indemnity insurance rate of the vessel was reduced by the sum of $2,300. (3) By decreasing the turnover of the crew, which resulted in a reduction in costs of hiring and training, a third, though indirect, saving was achieved.

 ABSTRACTER: Kathryn L. Osterhaug

2.3 SPRAY- VS. IMMERSION-BRINING OF HAKE FILLETS FOR QUICK FREEZING

Pienaar, A. G.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 16-17 (1957)

Some years ago, on the basis of laboratory results, F.I.R.I. recommended a trial of spray brining in place of batch immersion brining. One factory has recently started spray brining hake fillets for quick freezing instead of brining them by immersion, and the Institute was asked to investigate the two methods in practice.

In a series of tests under factory conditions, the effect of dipping fillets for 30 seconds in 11- to 12-percent brine was compared with continuous brining in which a solution containing 5 to 7 percent salt was sprayed onto the fillets for 12 seconds.

Hake "primes" (2½ lb.) in the same state of freshness were used throughout. For each test, two 50-lb. batches of fillets were prepared, allocating the left fillet from the first fish, the right fillet from the second fish, and so on, to Batch A, and the fillets from the other side of each fish to Batch B. One batch was then spray brined, and the other was dipped.

The fillets being sprayed moved through overhead jet sprays on a continuous open-mesh wire belt with their flesh sides facing the jets. The brine was circulated through coarse filters and reused continuously for about 4½ hours before being discarded. This is the manner in which the spraying machine was normally operated.

The dipping tests were carried out in a large tub with a fish-to-brine ratio of 1 to 10, and fresh brine was used for each dipping. Tagged experimental fillets (for salt determinations and storage

(over)

 Reprinted in whole

FLYING DEPTH RECORDER

HYDRAULIC LIFT DECK

HOLDING TANK CONSTRUCTION

SPRAY BRINING OF FILLETS

2.117

2.3

tests) were placed in a basket with the rest of the fillets, and the basket was immersed in the brine and moved around for 30 seconds, as was done before the spraying machine was installed.

The fish for the first two tests were filleted just before brining, but for the third test, they were filleted and left in aluminum bins for 2 hours at room temperature before brining.

Immediately after brining, the fillets were packed in molds containing three 5-lb. blocks of fish each and were frozen. The blocks of frozen fillets were stored at 15° F. Fillets were taken out after 14, 28, and 35 days and exposed to room temperature until off-odors developed. The degree of freshness was assessed by a scoring system in which 10 denotes "fresh," 0 denotes "putrid," and 5 or less than 5 signifies that the fish is no longer fit for sale. The time required for the odor score to drop to 5 is termed the "shelf life" of the specimen.

Test I was carried out after the brine in the spraying machine had been in use for $2\frac{1}{2}$ hours; and Test II, after $4\frac{1}{2}$ hours' use--that is, just before the batch of used brine was discarded. Test III was carried out just after the batch of fresh brine was put into use. The test fillets were the first to be sprayed with the fresh brine.

The salt contents, by chemical analysis, are given in Table 6 (omitted); and the results of the storage tests, in Table 7 (omitted).

It would seem from these tests that a more uniformly salted product is possible with spray brining than with immersion brining, even when the brine for spraying is used continuously for about 4 hours (without salt being added to maintain the brine strength). However, further tests should be carried out to confirm this.

From Table 7 it appears that, at temperatures varying from 60° F. to 70° F., the shelf life of fillets brined by immersion is about 2 hours (about 8 percent) longer than that of fillets brined by spraying. Sprays applied to the skin sides of the fillets, as well as to the flesh sides, might perhaps have reversed this order.

The longer shelf life of fillets sprayed with fresh brine as compared with fillets sprayed with reused brine is not necessarily an indication of deterioration of the quality of brine with use. Similar differences in shelf life are apparent for dipped fish, yet they were all dipped in fresh brine.

2.116

Several advantages are reported for this type of fish finding: (1) the helicopter can cover the fishing area much faster than can a patrol boat; (2) the fish are not frightened, as they might be by depth recordings taken by a patrol boat; and (3) the helicopter is able to operate over rough water that would both slow up a patrol boat and make depth recordings taken from it inaccurate.

This aerial-acoustical method is being used to locate herring in the Caspian Sea, cod and herring in the Barents Sea and in Far Eastern waters, and the anchovies, sprat, scad, and horse mackerel in the Black and Azov Seas. The method is particularly successful during fall and winter months, when herring and anchovies form large schools along the shores of the Crimea and the Caucasus.

2.117

unloading gates from each tank that open into the aft bulkhead, also provides for unloading the tanks into the dry hold, which is served by the main hatch immediately overhead. By grouping the three tanks into an integral unit, heat transfer into the tanks is reduced, and the dry hold is protected from engine room heat so that iced fish can effectively be carried in this section if fishing is heavy.

Tank construction details.--Apply 4 inches of "Foamglas" insulation laid in hot asphalt (1) to the tank side of the engine-room bulkhead, (2) to the portion of the hull and deckhead belonging to the tanks, and (3) to the shaft log. Fill the remaining irregularities with concrete, and smooth the surface with a trowel. Cover all exposed surfaces with asbestos paper. Install inner steel tank linings, made from 10-gauge steel plate, against the insulated engine-room bulkhead and hull. Weld only at the seams and do not attach to the hull. Weld two fore-and-aft bulkheads of corrugated 10-gauge steel plate to the tank linings. Install linings under the deckhead, and support with the trunks that lead into the tanks through the deck. Weld the aft-end tank linings into place to complete the tanks. Insulate this wall, and install a $\frac{1}{4}$-inch steel bulkhead across the end of the tanks by welding it to the hull. This bulkhead contains the three unloading doors. Completely seal the insulated space around the tanks. Locate the sea-water chiller in the engine room. Make piping connections to the sea-water chiller with stainless steel pipes brought through the engine-room bulkhead, and provide a pipe inlet and outlet for each tank. Locate valves and manifolds in the engine room. Supply refrigeration with a high-speed automotive-type compressor, driven by a belt from the main engine.

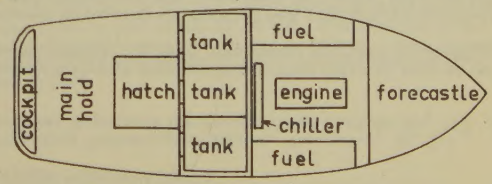

Figure 1.--Plan of the Ruth G II showing general layout.

2.1127 BLOODWORMS--MOST UNIQUE OF NOVA SCOTIAN INDUSTRIES

LeBlanc, Joe
Canadian Fisherman 45, 40-41 (December 1958)

As more and more American sports fishermen along the Atlantic Seaboard take up surfcasting, the demand for juicy bloodworms increases each year.

Yarmouth, Nova Scotia, has therefore joined its seaside counterpart in Maine to undertake to provide enough of the choice bait necessary for successful surf fishing. The worm-bait industry in Yarmouth is just 7 years old. Worm digging is of considerable importance to the local economy. Figures show that last year a total of approximately 4,000,000 worms were shipped to the United States. Figured at 1 cent per worm--the local digging price--this represents $40,000, and this figure multiplied by seven--for the age of the industry--equals over a quarter of a million dollars that has been dug out of the mud flats in and around Yarmouth and Wedgeport. Another hundred thousand dollars could be added in the way of air freight, wages to handlers, materials, transportation, and accommodations.

Except for a strong back, the needs of a digger are few; old clothes, rubber boots, a short-handled hoe, and a pail are all the equipment required. He works between tides, which amounts to about 4 hours from the time the tide has receded enough to uncover the flats until it flows in again and starts covering the flats once more.

Top-grade diggers, under good conditions, can uncover up to 1,600 worms in one tide, but the average is 700 to 900. With proper weather conditions, top diggers can earn from $60 to $75 per week, which is quite good pay in a country where $50 is considered a fair wage for a laborer. About

(over)

 ABSTRACTER: Kathryn L. Osterhaug

2.3 TECHNICAL NOTE NO. 46 - METHOD FOR REMOVING BLOOD FROM HALIBUT TO IMPROVE APPEARANCE OF FROZEN STEAKS

Miyauchi, David T. and Nelson, Richard W. (U. S. Bureau of Commercial Fisheries, Seattle 2, Washington)
Commercial Fisheries Review 20, 9-11 (October 1958)

Blood stains sometimes mar the appearance of fish steaks. These are especially noticeable when frozen white fish, such as halibut, is thawed.

The blood that is responsible for causing most of the discoloration is from the large blood vessel that runs down the length of the fish adjacent to the backbone.

The problem of these blood stains can be overcome by a simple mechanical procedure. While the belly cavity of the fish is being washed, remove the blood as follows: (1) make a small cut to expose the blood vessel at the tail; (2) attach to a water hose an adapter that reduces the diameter of the water outlet to about $\frac{1}{4}$ inch; (3) insert the adapter into the opening of the blood vessel in the belly cavity; and (4) using a stream of water, flush the blood out through the cut in the tail section.

This procedure has been used only with halibut. It should be applicable, however, to other fish, such as the large salmon used in mild-curing, where it is desirable to get rid of all possible blood.

When frozen steaks cut from halibut that had been experimentally washed were thawed and closely examined, none of the steaks were found to have blood stains.

See illustration, over.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

2.118 ECONOMICS OF FREEZING FISH AT SEA WOULD PROVIDE BOOST FOR INDUSTRY

Anonymous
Quick Frozen Foods 21, 89-92 (January 1959)

Adoption of a method of freezing fish at sea by trawlers operating out of Boston would benefit all segments of the fishing and fish-processing industries, according to an analysis conducted by the U. S. Bureau of Commercial Fisheries.

Drawbacks. -- Few members of the industry are willing to adopt the new method at this time because the initial investment necessary to convert the existing trawlers to freezing at sea would be very high. It was pointed out, however, that incorporation of freezing-at-sea equipment in new trawlers would not materially increase the cost of the trawlers if they were added to the fishing fleet in the future.

Other disadvantages of the method are unwillingness of the labor force to spend longer times at sea and high maritime insurance rates.

Advantages. -- According to Sumner M. Rosen of the Bureau of Commercial Fisheries, freezing fish at sea would smooth out seasonal variations of catches and prices, thus making possible more efficient utilization of trawlers and equipment, at lower cost and higher rates of return than prevail under present conditions.

Freezing at sea would greatly improve the quality of seafood. Deterioration resulting from the weight of later catches on fish stored in the bottom of the holds is eliminated, since the lower layers

(over)

 ABSTRACTER: June H. Olden

2.9 SHELLFISH TOXICITY AND THE WEATHER IN THE STRAIT OF GEORGIA DURING 1957

Waldichuk, Michael (Fisheries Biological Station, Nanaimo, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 112, 10-14 (December 1958)

Toxic area. -- An outbreak of shellfish poisoning in British Columbia during October 1957 was caused by the consumption of mussels, clams, and oysters taken from coastal areas near Comox. Serious cases of illness were reported by the medical health officer, Dr. L. S. Anderson.

Toxicity tests by the Food and Drug Directorate of the Department of National Health and Welfare showed that the toxic shellfish were confined primarily to that part of the Strait of Georgia northwest of a line extending from Ladysmith to Sechelt. The focal point of the outbreak was located near Little River, just north of Cape Lazo, and all oyster-growing areas adjoining Baynes Sound showed dangerous levels of toxicity. The northeast side of the Strait of Georgia as far south as Pender Harbor also yielded shellfish with high toxicities, especially clams.

Toxicities slightly in excess of 200 mouse units (m.u.) were found in oysters from the Ladysmith and Crofton oyster-growing areas. One mouse unit is defined as the amount of toxin in a shellfish extract that will cause a standard 20-gram mouse to die with paralytic symptoms within 15 minutes from the time of injection.

Features of the outbreak. -- Unusual features apparent in the British Columbia shellfish toxicity outbreak in 1957 were as follows: (1) Pacific oysters (Crassostrea gigas) were affected in addition to various species of clams and mussels; (2) marine waters not exposed directly to the open ocean

(over)

 ABSTRACTER: Martin Heerdt

2.118

are solid and resist pressure of subsequent layers. Freezing also inhibits bacterial action and makes longer trips possible.

By promoting a higher uniform standard of quality, this method would increase public confidence in seafoods. Freezing at sea would permit the trawler to stay at sea until its hold capacity is largely utilized, thus lowering operating costs.

Freezing at sea would go a long way toward stabilizing prices. It would eliminate the practice of "sellover"--a feature of ex-vessel sales peculiar to New England in which after the original sale of fish is made, there may be a resale if the fish being unloaded do not qualify as first quality.

Some members of the industry interviewed predicted that adoption of freezing at sea would come and must come if the industry is to survive.

2.9

were involved; (3) toxic molluscs were obtained from marine waters that are moderately calm and relatively distant from water subject to intensive mixing and upwelling; and (4) clams from these areas continued to be toxic through the winter of 1957 to 1958 and late into the spring of 1958, whereas oysters cleared themselves of toxin within 6 weeks after the earliest reports of shellfish poisoning.

Cause of the outbreak. -- The author assumed that the toxicity in these shellfish was caused by dense crops of certain dinoflagellates, or one-celled plant organisms capable of movement. The unusual weather recorded along the lower British Columbia coast in 1957 is believed to have been responsible for providing suitable conditions and possibly an enriched medium from soil run-off water for the rapid growth of these marine organisms. In 1957, a relatively warm spring was followed by moist, cool conditions with heavy rains in the northern Strait of Georgia for the first half of the summer. Sunny, warm, and windless weather was recorded for the period mid-August to mid-September.

Residents in the area reported large patches of red water that is popularly referred to as "Red Tide" during late summer. Generally, red water is caused by a dense concentration of any one of a variety of species of phytoplankton. Although red water has been observed in the Strait of Georgia during other years when shellfish toxicity was not reported, a connection may have existed between the red conditions observed in 1957 and the toxicity that followed. Shellfish can become toxic even if concentrations of the causative organism are not great enough to cause a spectacular discoloration of the water. Although meterological information might serve as a useful guide for predicting shellfish toxicity, shellfish harvesters and health authorities should continue to maintain a vigil for shellfish toxicity throughout the year.

2.1127

200 men and boys in this area are engaged in the industry from April to the end of October.

Worms go to outlets in New York, Washington, and Baltimore, where surfcasters pay 75 cents a dozen for them. There is a small but promising market in California, where mudworms are found, Bloodworms are reported to be much better for surf fishing.

Preferably 4 to 8 inches long for marketing purposes, the worms apparently are sensitive to temperature changes. They don't like warmth, a characteristic that makes things tougher for diggers. Although worms will be only about 2 inches deep on cool, foggy days, when it's hot, they go deeper and production slows down.

For some inexplicable reason, bloodworms are not found in large enough volume outside of the immediate Yarmouth County area to make the venture profitable.

The worms, after having been properly culled so that only grade-one specimens remain, are boxed in long, flat cardboard containers. Wax paper and a newspaper on the bottom of the box are covered with a layer of salt water rockwood. Approximately 250 worms are then spread over the rockwood, and the box is covered. These are shipped immediately by air freight, arriving at their U. S. destinations only a few hours after leaving the Yarmouth airport. Should there be a delay in transit, air cargo handlers are instructed to turn the boxes upside down, since the worms keep working their way through the rockwood. It is important that this prized species of bait reach the surf fishermen along the Atlantic seaboard from Connecticut to Virginia in good condition.

2.3 **(Cross Reference: 3.23)**

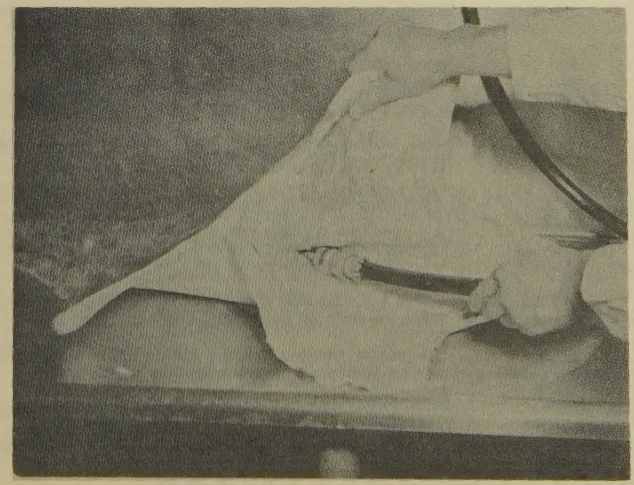

Figure 3. - Method of inserting water cock into blood vessel.

3.12 CHEMICAL PRESERVATION OF FOODS

Tarr, Hugh L. A. (Fisheries Research Board of Canada, Vancouver, British Columbia, Canada)
Studies 1957 from the Stations of the Fisheries Research Board of Canada, FRB 499, 14 pp.

Food preservatives. --Canadian Food and Drug Regulations permit four classes of preservatives as follows: (1) salt, sugar, glucose, nitrates, wood smoke, vinegar, spices, alcohol, and not more than 200 parts per million (p.p.m.) of sodium nitrite in cured meats and fresh fish only; (2) benzoic acid, sulphurous acid, and sorbic acid and their salts; (3) propionic acid and its salts, sodium diacetate, and sorbic acid; and (4) the antioxidants: gum guaiacum, vegetable oil containing alpha tocopherols, lecithin, citric acid, tartaric acid, ascorbic acid, propyl gallate, butylated hydroxyanisole, ascorbyl palmitate, nordihydroguaiaretic acid, and isopropyl citrate.

Preservation with antibiotics. --In several antibiotics studies, only aureomycin or chlortetracycline (CTC), terramycin or oxytetracycline (OTC), and chloromycetin gave promising results. Of these three, CTC was most effective. Initially, a group of workers from Ohio State showed that of 92 separate bacterial strains representing 12 genera isolated from meat, 81 were sensitive to CTC; 77, to OTC; and 74, to chloromycetin. Observations led to the conclusion that in the deep tissues of beef animals, the main centers of bacterial infection were the lymph nodes. Studies with whole animals infused post-mortem via one carotid artery showed that treatment with CTC retarded bacterial spoilage very significantly. Surface bacterial growth on carcasses was strongly retarded by using a spray of CTC.

Initial studies with fish were based on (1) the use of minced flesh and (2) dipping procedures with fish and fillets. These trials indicated that CTC was the most effective antibiotic for the purpose and that CTC should be introduced as soon as possible after capture of fish. This was most readily

(over)

ABSTRACTER: Martin Heerdt

3.12 THE USE OF ANTIBIOTICS FOR THE CONTROL OF SPOILAGE IN THE EAST COAST FISHERIES. PART III. FACTORS AFFECTING THE AMOUNT OF ANTIBIOTICS TAKEN UP BY FILLETS

Castell, C. H. and Greenough, Maxine (Fishery Technological Station, Halifax, Nova Scotia)
Canadian Fisherman 45, 12-13 (December 1958)

Several conditions influence the amount of antibiotic absorbed by fish from dipping solutions. These include (1) the concentration of the antibiotic in the solution, (2) the length of time the fish are immersed, (3) the temperature of the dip, (4) the size of the fillet, and (5) the physical condition of the fillet.

Observations indicate that, under normal plant conditions, fillets pick up amounts of antibiotic in the range of 1/10 to 1/50 that of the dipping solution. If fillets are dipped in a solution containing 20 p.p.m. chlortetracycline (CTC), for instance, the average dipped fillet will contain between 0.5 and 2.0 p.p.m. of CTC.

The amount of antibiotic picked up by individual fillets varies to some extent. If fairly high concentrations of antibiotic are used, some fillets may pick up more of the compound than the amount permitted by law.

Table 6 (see over) shows the average, minimum, and maximum amounts of CTC picked up by 14 different lots of fillets. The data indicate that if fillets are given short dips of 2 minutes or less, the maximum amount of CTC picked up by individual fillets is within the 5 p.p.m. permitted by Canadian law.

Larger and thicker fillets pick up less antibiotic than do small fillets, but the physical condition of the fillets complicates this relationship. Fresh, firm, even fillets take up less antibiotic than do those that are soft, ragged, and flaked open.

The temperature of the dipping solution also has an effect on the amount of antibiotic picked up.

(over)

ABSTRACTER: Kathryn L. Osterhaug

3.12 EFFECT OF CHLORTETRACYCLINE (CTC) ANTIBIOTIC ON THE KEEPING QUALITY OF LINGCOD STORED IN REFRIGERATED SEA WATER

Baker, E. G.; Southcott, B. A.; and Tarr, H. L. A. (Fisheries Technological Station, Vancouver, British Columbia)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 112, 15-17 (December 1958)

Experimental. --Equipment used in this study consisted of two tanks, each 12 x 12 x 27 inches, constructed of plywood, lined with a synthetic rubber compound, and partially filled with sea water that was pumped continuously through a separate thermostatically controlled shell and tube heat exchanger. Ten parts per million (p.p.m.) of CTC was added to the sea water placed in one of the tanks, and the sea water in both tanks was chilled to and then maintained at 30° to 32° F. Lingcod that had been eviscerated at sea and were still in rigor were placed in these tanks. The ratio of lingcod to sea water was 2 to 1.4. At intervals, a single fish was removed from each tank and examined organoleptically by two judges.

Samples of lingcod tissue were taken under clean conditions and stored for 18 hours at 50° F. before the number of available bacteria was determined. Previous work has indicated that this technique indicates the potential keeping quality of fish. Bacterial counts were made by a direct method, which determines both living (viable) and dead organisms, and by viable counts, which determine only living bacteria. Since fish in refrigerated sea water are held under conditions of storage that are somewhat anaerobic, both aerobic and anaerobic counts were made of the viable bacteria.

Results. --In the first experiment, ten lingcod with an average weight of 8-7/8 pounds were stored for 20 days in artificial sea water prepared in the laboratory. The lingcod were weighed

(over)

ABSTRACTER: Martin Heerdt

6.32 THIRD INTERNATIONAL SEAWEED SYMPOSIUM

Richardson, W. D. and Dewar, E. T.
Nature 182, 1779, 1780-1781 (December 27, 1958)

The third International Seaweed Symposium was held in Galway, Ireland, during August 13 to 15, 1958.

The chemistry of the polysaccharides of the brown, red and green algae was covered by Prof. E. L. Hirst (Scotland); and Dr. H. M. Ulrich (Austria) dealt specifically with alginic acid and its derivatives. Low molecular compounds were discussed by Mr. B. Wickberg (Sweden). Dr. J. R. Turvey (Wales) dealt with the polysaccharides of Porphyra umbilicalis, which include a galactan sulphate, floridean starch, mannan, and xylan; the galactan sulphate contains D-galactose, 6-0-methyl-D-galactose and 3 : 6-anhydro-D-galactose. 6-0-Methyl D-galactose has been isolated from several Porphyra species, and Dr. J. C. Su (Formosa) reported its presence in P. crispata. Prof. P. S. O'Colla (Ireland) discussed the constitution of the mucilage from Laurencia pinnatafida, which contains galactose, xylose, galacturonic acid, and sulphate; the branched structure contains a 1 : 3-linked galactan backbone.

Dr. E. G. Young (Canada) pointed out the many difficulties encountered in examining the amino-acids, peptides and proteins of Chondrus crispus; about 20 to 30 percent of the protein nitrogen could not be solubilized, but the distribution of amino acids in this insoluble protein was similar to other algal proteins. Mr. M. O. Reachtaire (Ireland) read a paper on phycoerythrin and phycocyanin, and the absorption spectra and structure of these chromoproteins were discussed. Dr. C. O hEocha (Ireland) described the occurrence and distribution among a number of red algae, particularly in the Rhodomelaceae, of four water-soluble fluorescent substances; these were extracted, separated

(over)

Reprinted in part

3.12

initially and at intervals thereafter. During the first week of storage, the gain in weight did not exceed 0.5 percent. The average gain in weight throughout the 20-day experiment was about 3.5 percent.

For the first 11 days, all lingcod remained fresh. After this period of time, fillets cut from lingcod that were held in sea water without CTC were slightly putrid or putrid. Fillets cut from lingcod that were held for 14 days in refrigerated sea water with 10 p.p.m. CTC were slightly stale. In this study, total bacteria counts were considerably higher than viable counts. Sea water with 10 p.p.m. of CTC, however, kept the total bacteria counts obtained from lingcod at a low level. Aerobic viable counts obtained from lingcod held in sea water with CTC also were low. The very low aerobic and anaerobic viable counts that persisted throughout the first half of the experiment indicated the presence of a very large proportion of bacteria either dead or not able to grow either aerobically or anaerobically under laboratory conditions. Viable bacterial counts obtained from lingcod held for 7 days in sea water with CTC or in sea water without CTC showed no important difference. The CTC content of the sea water decreased slowly with time. Concentrations of CTC usually were higher in the skin of the lingcod than in the flesh; however, flesh concentrations of CTC were in general considerably higher than concentrations previously found in halibut that had been stored in refrigerated sea water containing 3 to 5 p.p.m. of CTC.

A second and similar experiment with lingcod was carried out with Vancouver harbor sea water that had been adjusted to contain 3 percent salt by the addition of sodium chloride. This harbor water contained typical lactose-fermenting "coliform" bacteria indicative of sewage pollution. Examination revealed (1) that in sea water with added CTC, these bacteria disappeared rapidly and (2) that none of these bacteria were detectable after 7 days of holding. In sea water without added CTC, lactose-fermenting coliform organisms still were present after 7 days. Fillets cut from lingcod that were held for 10 days in sea water with added CTC and then stored for 18 hours at 50° F. were rated fresh with one exception, whereas fillets cut from lingcod held for 6 days in ordinary sea water developed off-odors and were rated stale or putrid. Results of bacteriological tests were similar to those obtained in the first study.

3.12

accomplished by incorporating the antibiotic into (a) ice used for icing fish, (b) refrigerated sea water used for transporting fish, or (c) a fairly strong antibiotic solution used as a dip prior to icing with ordinary ice. For simplicity in initial trials, CTC was incorporated at a concentration of 1 p.p.m. in flake ice and used for icing salmon experimentally during one fishing season. Bacterial spoilage in troll-caught salmon was controlled.

Since little flake ice is produced in most fishing areas, the problem of obtaining block ice with uniform distribution of CTC was encountered. Both carrageen and carboxymethylcellulose in comparatively low concentrations of 0.005 to 0.10 percent were found to be effective dispersing agents for CTC. In systems lacking certain metallic salts, inadequate distribution of CTC occurred, and the presence of salts such as calcium acetate was found necessary for even distribution. Crushed ice containing CTC, flake ice containing CTC, and dips containing CTC gave excellent protection against bacterial spoilage with a number of different species of fish. Although CTC exerts a valuable preservative effect upon shellfish such as shrimp, crab meat, and oysters, comparatively high concentrations of 5 to 20 p.p.m. must be used to achieve a marked preservative effect.

Antibiotic residues. -- The cooking of poultry containing CTC causes the antibiotic activity in the flesh to disappear, owing to the formation of a harmless isomeric isochlortetracycline, which is devoid of antibiotic activity. The comparatively small residues that remain in fish after they have been iced with ice containing CTC are largely or entirely removed by normal cooking. In fish, treatment with CTC tends to repress the development of (1) Clostridium botulinum type E and (2) food poisoning staphylococci.

Development of food antioxidants. --Both ascorbic acid and isoascorbic acid have been used in fish, and both afford marked protection against oxidation of the red pigments of salmon and of Atlantic rose fish during frozen storage. Protection of frozen fish from the development of off-flavors due to oxidative rancidity has been reported from some laboratories, whereas others have reported no protection. A very marked synergistic effect has been observed between ascorbic acid and wood smoke in inhibiting the development of oxidative rancidity in chilled salted mackerel.

A total of 77 references are cited.

6.32

by chromatography, and characterized by their absorption spectra.

The polysaccharides of Acrosiphonia centralis, a green alga closely related morphologically to Cladophora rupestris, were reported by Dr. E. Percival (Scotland); partial hydrolysis of a sulphated polyuronide gave chiefly glucose, xylose, rhamnose and oligouronic acids composed mainly of rhamnose and glucuronic acid.

The seasonal variation in the alginic acid content of Ascophyllum nodosum was discussed by Mr. D. T. Flood (Ireland), while the effect of species, habitat, pretreatment of the seaweed and isolation procedures on the viscosity of alginate solutions was covered by Mr. A. Haug (Norway). Methods for determining alginic acid were reviewed by Mr. M. F. Van der Lande (France), and details of the copper acetate and a new potentiometric titration method were given. The precipitation of sodium alginates of different degrees of polymerization by salts of lead, calcium, nickel and manganese was shown by Mr. R. H. McDowell (England) to be a complex problem and highly dependent on alginate concentration. The birefringent properties of alginate and carragheenate with colloid cations, for example, polyglucosamine, were demonstrated by Dr. L. Langmaack (Germany). The fucosan content of A. nodosum was reviewed by Mr. A. Haug (Norway), and the influence of habitat on this and other constituents such as niacin was discussed by Mr. B. Larsen (Norway).

Both chemical and enzymic methods for removing sulphate groups from carbohydrates are of extreme importance in the elucidation of structure of the many algal polysaccharide sulphuric esters, and these were reviewed by Dr. P. F. Lloyd (Wales). The use of the mass spectrometer in carbohydrates problems was outlined by Mr. P. A. Finan (Scotland); Dr. C. C. Burt (Scotland) described the results of animal experiments with sodium laminarin sulphate as a blood anticoagulant.

The occurrence and utilization of algae in the Caribbean and Morocco were discussed by Mr. W. D. Richardson (British West Indies) and Mr. G. Apikian (Morocco), respectively. The value of two New Zealand species, Pachymenia himantophora and Durvillea antarctica, as a fertilizer was assessed in a paper read by Mr. M. O. Reachtaire (Ireland). The interesting work being carried out in Norway on the use of seaweed meal as a supplement in animal feeding-stuffs was reported at the last symposium; Prof. J. Höie and Mr. A. Jensen (Norway) described further trials with chicks, hens, rats, and sheep.

3.12

Fillets that were dipped in solutions of antibiotic held close to the freezing point picked up considerably less antibiotic than did fillets dipped in solutions held at 45° F. and at 77° F.

Table 6. - Fourteen lots of sole and cod fillets were dipped into CTC or OTC solutions having concentrations of 10 to 50 p.p.m. This table shows the amounts of antibiotics picked up by the fillets and given as the average value for each lot, and also the values for the fillets with the least and the most antibiotics for each lot.

Conc. of antibiotic (p.p.m.)	Dipping time (min.)	Fish species	Concentration of antibiotic in fillets in p.p.m.		
			Average	Minimum	Maximum
50	1	sole	2.44	0.88	3.76
50	2	sole	2.17	0.72	4.08
50	2	sole	2.03	0.40	2.76
30	1	cod	2.40	1.54	3.18
30	1	cod	2.33	1.40	3.24
28	1	sole	2.78	1.76	4.80
25	2	sole	1.42	0.68	2.60
25	1	cod	1.32	0.41	2.53
25	2	sole	1.51	0.68	2.16
20	¼	cod	1.01	0.88	1.12
20	1	cod	0.98	0.63	1.41
10	½	cod	0.68	0.37	1.01
10	2	sole	0.53	0.21	1.08
10	2	sole	0.43	0.21	1.00
10	1	cod	0.27	0.01	0.87

3.17 DISTRIBUTION OF CHLORTETRACYCLINE (CTC) ANTIBIOTIC IN ICE MADE FROM HARD WATERS

Moyer, R. H.; Southcott, B. A.; and Tarr, H. L. A. (Fisheries Technological Station, Vancouver, B. C.)
Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations No. 112, 21-22 (December 1958)

Introduction.--Previous work at the Pacific Station has shown that chlortetracycline (CTC) can be effectively dispersed throughout blocks of ice with the aid of the hydrophilic colloids, carrageen from Irish moss and carboxymethylcellulose (CMC). Recent tests have indicated that purified sodium and potassium alginates are almost as satisfactory as carrageen and CMC for this purpose. These colloids provide good dispersion in relatively "soft" waters, but they are not satisfactory if used with "hard" waters.

Experimental.--Reasonably good dispersion is obtained in ices made with hard water if the liquid is kept nearly neutral or at pH 6.0 to 6.8, but under these conditions, a gelatinous precipitate and foamy scum appear as the ice melts. The precipitate and scum probably are double salts of calcium or magnesium combined with the hydrocolloid and CTC. According to table 1 (see over), as much as one-half of the CTC may be precipitated and unavailable for fish preservation, although the precipitate still retains antibiotic activity.

The data in table 1 also show less inactivation of CTC if the dispersant is CMC rather than carrageen. CMC provides satisfactory distribution, but it is slightly poorer as a dispersant than is carrageen in the same concentration. Hard water containing carrageen and CTC retained most of its antibiotic activity and formed very little precipitate if held unfrozen at 0° C. for 1 week. The physical action of freezing therefore is necessary for precipitation of the double salt. A solution of the antibiotic alone in hard water without added hydrocolloid retained most if its activity on freezing.

Ices prepared from solutions having a pH of 3.0 to 5.0 and containing a hydrocolloid plus CTC

(over)

ABSTRACTER: Martin Heerdt

3.239 FISH HANDLING AND FREEZING. III. CHANGES DURING FREEZING AND FROZEN STORAGE

Empey, W. A. (Division of Food Preservation and Transport, C.S.I.R.O., Hoembush, N.S.W., Australia)
Food Preservation Quarterly 18, 76-78 (December 1958)

Except for the natural increase in volume that takes place during freezing, all of the changes that take place in frozen fish are influenced to some degree by the (1) freshness of the fish at time of freezing, (2) treatment of the fish before freezing, (3) freezing conditions, (4) temperature and length of storage, (5) method of thawing and handling, and (6) species of fish.

Importance of freshness.--The first discernible change in fish after death is loss of the flavor and odor that is characteristic of the species. Changes caused by bacterial and oxidative agencies follow. Even though the growth of bacteria practically ceases after the temperature of the fish has been reduced to about 20° F., the bacterial end-products that were produced prior to freezing are retained in the flesh and may be involved in chemical changes that affect odor and flavor.

Oxidative changes that have taken place before freezing will affect the frozen product. Even though rancidity is not apparent before freezing, the body oils already may have passed through the induction or lag period of oxidation and therefore may be susceptible to the rapid development of rancidity during frozen storage.

Texture changes take place in fish while they are being held before freezing and are carried over and superimposed on those that develop during frozen storage. These changes cause the final cooked fish to be "dry" or tough.

The loss of liquid, "drip," from the cut surfaces of the thawed fish is greater when the fish have been held for long periods before freezing.

Treatment before freezing.--Care in handling to minimize bacterial contamination, special treatments to reduce drip, and effective packaging to prevent desiccation and minimize oxidation

(over)

ABSTRACTER: Kathryn L. Osterhaug

3.18 CONTROLLING FISH MEAL PROCESSING ODORS THROUGH ODOR COUNTERACTION

Post, Nicholas K.
Canadian Fisherman 46, 24-25, 27 (January 1959)

Odors usually are identified by being compared with something similar. An example of this is hydrogen sulfide's being described as having a rotten-egg odor. It is difficult in general either to describe or to characterize odors. The degree of sensitivity of individuals to odors varies widely. In spite of the wide individual variation in sense of smell, the nose is the most sensitive analytical device known today for detecting odors. Identification of specific odors largely is a matter of experience. Classification is considered to be highly subjective. One table classifies odors into eight categories as follows: (1) ethereal--fruits and beeswax; (2) aromatic odors--cloves, lavender, and camphor; (3) fragrant odors--flowers and perfumes; (4) ambrosial odors--musk; (5) garlic odors--garlic, onion, and certain sulphur compounds; (6) burning odors--burning feathers, tobacco, roast coffee, and odors of this type; (7) goat odors--sweat, ripe cheese, and caproic acid; and (8) repulsive or nauseating odors--rotting meat, vegetables, or excrement.

The intensity of odors also is subjective. An example of an odor-intensity scale uses a range of from zero to four. Each point represents a different intensity rating. Zero would be no odor or no odor of the designated component. Number one would represent the threshold level of the component; number two would be the definite odor of the component; number three would represent a strong odor intensity; and number four, an overpowering odor of the component.

Methods of controlling odor.--Four primary methods are commercially available to control industrial odors. These are (1) incineration, (2) absorption, (3) adsorption, and (4) odor modification

(over)

ABSTRACTER: Kathryn L. Osterhaug

6.32 THE CHEMICAL COMPOSITION AND STRUCTURE OF THE CELL WALL OF CHLORELLA PYRENOIDOSA

Northcote, D. H.; Goulding, K. J.; and Horne, R. W. (University of Cambridge, England)
The Biochemical Journal 70, 391-397 (November 1958)

Material used.--Chlorella pyrenoidosa was grown under sterile conditions on a completely defined salt medium of Emerson and Lewis (1939) in large flasks. A current of air + CO_2 (95:5) was passed through the medium (600 ml./min.) and growth was maintained for 10 to 14 days in daylight in a window facing west. The cells were harvested by centrifuging (1500 grams (g.) for 20 min.), and washed with water and recentrifuged. Yield was approximately 0.7 g. dry wt./liter.

A cell-wall fraction of Chlorella pyrenoidosa has been isolated after disintegration of the whole cells in a Mickle cell disintegrator followed by differential centrifuging. The isolated wall has been shown to be free of whole cells and debris. It is approximately 210Å thick and represents 13.6 percent of the dry weight of the whole cell. The structure of the wall has been studied by the electron microscope and shown to be a two-phase system in which microfibrils approximately 30 to 50Å in diameter are enclosed in a continuous matrix.

A quantitative chemical analysis of the wall has been made with respect to the following fractions: α-cellulose, hemicellulose, protein, lipid and ash. Glucosamine has been estimated. The protein, some of which may exist as a glycoprotein, is associated with the hemicellulose and with these polysaccharides makes up the greater part of the continuous matrix. The microfibrillar structure, which is nearly all polysaccharide, corresponds to the α-cellulose of the chemical analysis. It is composed of polymers of glucose, galactose, mannose, arabinose and rhamnose. The hemicellulose can be isolated as an electrophoretically pure polysaccharide from the whole cell and some of its

(over)

Reprinted in part

ANTIBIOTIC ICE

FISH PLANT ODOR CONTROL

CHANGES IN FROZEN FISH

COMPOSITION OF CHLORELLA PYRENOIDOSA

3.18

or counteraction. Method number four is discussed in this report.

Certain pairs of odors in appropriate relative concentrations are antagonistic. When sniffed together, both odors diminish in intensity. In practical application, a liquid counteractant odor is vaporized into the air stream and, by molecular dispersion, combines with the malodors traveling along a wind stream. In this manner, neutralization of the malodors is effected.

The odors present in a plant processing fish and fish products generally are complex groups of odors. The predominant odors may include ammonia, amines, and sulphides. A three-point program is suggested for controlling odors in fish-meal plants. (1) Vaporize odor counteractants into the main areas that are discharging odors into the atmosphere. (2) Provide adequate ventilation for the plant. (3) Practice proper sanitation. There is no method of treating odorous air that is a substitute for good sanitation.

3.17

retained a greater percentage of their activity than did those nearer the neutral point or pH 6.0 to 8.0; the distribution of CTC, however, was extremely poor. Attempts to devise methods for good distribution under acid conditions have been made without success. Conditioning of hard water also has been attempted with a cation exchange resin such as Amberlite IR-120 in the sodium form. Information on the distribution or the stability of the antibiotic are not available as yet. Attempts also are being made to remove the magnesium and calcium from hard waters by the addition of a sequestering agent that would combine preferentially with these ions and prevent the formation of undesirable CTC combinations.

Table 1.--Antibiotic activity in blocks of ice made from "hard" and "soft" waters.

Composition of solution containing 10 p.p.m. CTC prior to freezing	Concentration of CTC in filtrate of melted ice
	p.p.m.
Hard water + 0.01 percent carrageen	5.3
Hard water + 0.01 percent CMC	7.7
Hard water	8.3
Demineralized (soft) water + 0.01 percent carrageen	8.7
Demineralized (soft) water + 0.01 percent CMC	9.3
Demineralized (soft) water	9.8

The artificially prepared hard water contained 66.9 p.p.m. of calcium and 31.4 p.p.m. of magnesium, both added as the carbonate. The pH of the solution was 6.2. Hercules CMC No. 70 LL was used in this experiment, but higher viscosity types have been used with similar results. The carrageen was Seakem Type No. 2.

6.32

characteristics have been studied quantitatively. An acid hydrolysate contains galactose, mannose, arabinose, xylose and rhamnose.

The microfibrils are present as a continuous irregular network over the cell wall and throughout its thickness. They lie approximately in two directions at right angles to one another. The continuous matrix is granular in appearance. Microscopical examination and chemical analysis of cell walls treated with snail digestive enzyme show that some of the substances of which it is composed are partially localized in two regions. One of these is near the outer surface and the other near the inner surface of the wall.

3.239 (Cross Reference: 3.249)

will to help to prolong the storage life of frozen fish both during storage and after thawing.

Effects of freezing.--The formation of drip is a direct result of freezing and increases as the time taken to pass through the critical zone of 30° to 23° F. is increased.

Unprotected surfaces of fish that are exposed to dry, cold air moving at high speeds will be dried appreciably during freezing.

Salt penetration is a problem when fish are frozen in salt brine. The penetration of salt may (1) be too great for palatability, (2) increase the rate of oxidation of the surface oils, and (3) make it difficult to apply an ice glaze to the surface of the fish.

Effects of frozen storage.--During frozen storage, the following changes may take place in frozen fish: (1) alteration in surface color, (2) surface drying, (3) loss of natural aroma and flavor, (4) development of off-odors and flavors, (5) alteration in texture, and (6) some increase in formation of drip. All of these changes are dependent upon the temperature and duration of storage. The rate of these changes is approximately halved by each reduction of 18° F.

Thawing frozen fish.--There is no clear evidence that fast thawing gives a product of better quality than does slow thawing.

After thawing, the fish again become subject to bacterial spoilage by micro-organisms that have survived freezing and storage. The flesh of thawed fish does not spoil more rapidly than that of unfrozen fish with a similar population of bacteria.

Influence of type of fish.--Some species of fish are more suitable for freezing than are other species. Oily fish tend to be more prone to the development of rancidity than are lean fish, and certain oily species are particularly susceptible to oxidative rancidity because of the chemical constitution of their body oils.

The rate of change in texture of the flesh of oily fish is usually slower than it is in nonoily species. Drip losses usually are greater in fish with coarse-textured flesh.

3.249 TIME-TEMPERATURE TOLERANCE OF FROZEN FOODS. XV. METHOD OF USING TEMPERATURE HISTORIES TO ESTIMATE CHANGES IN FROZEN FOOD QUALITY

Van Arsdel, W. B. and Guadagni, D. G. (Western Regional Research Laboratory, Albany 10, California)
Food Technology 13, 14-19 (January 1959)

A method of estimating changes in frozen food quality and of predicting the remaining storage life is described. The rates of change at steady temperatures are used as a basis for evaluating the effects of the actual temperature history. The first step in the procedure is to obtain experimental data on the change in the characteristic in question at various steady temperatures. A smooth curve is derived to express the relationship between temperature and the relative rate of change of the characteristic. Characteristic changes found to be applicable for fruits are (1) ascorbic acid loss in frozen strawberries, (2) change in raspberry sirup color, and (3) change in surface color of peach slices. Two conditions are necessary for the use of such characteristics: (1) the change must be simply additive with temperature; and (2) it must be commutative, that is, the final effect must not depend on the order in which the temperature experiences are presented.

A coordinate system is constructed in which uniformly spaced abscissae represent time and ordinates are spaced in proportion to the rate of change of the characteristic at successive temperatures (see figure 1, over). The known irregular temperature history of a particular lot of frozen food is plotted in this system and the points connected with a smooth curve (see figure 8, over). The area beneath the curve is proportional to the total amount of change in the measured quantity. This is equivalent to an integration by graphical means of the qualitative changes over the temperature history.

Using this procedure, good agreement was obtained between actual values of color and ascorbic acid changes in an irregular time-temperature pattern and calculated values based on the equivalent number of days at 20° F. (from figure 8) and the average rate at 20° F. (from figure 1). This is in agreement with results from regularly fluctuating temperatures on strawberries and raspberries and

(over)

 ABSTRACTER: John A. Dassow

3.5 FISHERIES EXPERIMENTAL PLANT

Woodland, Bruce
Trade News 11, 3-5, 10 (November 1958)

Scientists at a new experimental plant in Newfoundland, Canada, are working on practical problems related to the salt fish industry. The basic purpose of the program is to bring automation to the salt fish processing industry at all stages of production.

An effort is being made to (1) increase speed, (2) reduce labor, and (3) protect quality during the unloading of fishing vessels.

An aim of the work is to make maximum use of mechanical devices on the plant wharf. An example is the electrically operated swinging crane that lifts boxes of fish from the fishing boat to the weighing platform and from there to the splitting table. Plans call for the gutting, heading, and splitting operation to be performed by machine. Most of the lifting and transporting of fish is done with a fork lift truck.

Investigations are being made to find new processing methods that will shorten the time necessary to produce the traditional cures of fish. One approach to this is the curing of fish in constant-strength brine. The brine is kept at a constant strength by circulating it through a salt bed. Heavily salted fish of high quality can be produced by this means in one-third the time of the old methods. Trials with lightly salted fish indicate that they may be readied for drying in 5 hours, compared with the present period of 5 days.

A plastic-lined wooden tank for pickling fish has been developed that can be made for one-quarter the cost of conventional metal tanks. The wooden tanks also are more adaptable to moving

(over)

 ABSTRACTER: Kathryn L. Osterhaug

3.2497 STORAGE AND TRANSPORTATION OF FROZEN FISH

Dyer, W. J. (Fisheries Research Board of Canada Technological Station, Halifax, Nova Scotia)
Canadian Fisherman 44, 37, 39, 41, 43 (June 1957)
Studies 1957 from the Stations of the Fisheries Research Board of Canada, FRB No. 510B (1958) (Ottawa)

Desiccation.--The first obvious change in frozen fish is desiccation or freezer burn. Desiccation is a loss of moisture that results in a dry papery surface that will not reconstitute to a palatable product on cooking. This change may be prevented by glazing round and dressed frozen fish and by wrapping fillets and packaged products in moisture-vapor-proof paper. Bacterial spoilage stops during frozen storage, as do most enzyme activities, except for some changes caused by fat-splitting enzymes.

Changes in quality.--Work on frozen cod and haddock fillets showed; (1) Initial changes in quality were concerned with texture; texture gradually toughened until chewiness and dryness developed. (2) Off-odor and off-flavor developed after the change in texture was nearly complete; the odor and flavor developments were characteristic of fat spoilage.

The author also found that actomyosin, a fraction of the protein, which represented about 75 percent of the total protein, gradually became insoluble during storage. The actomyosin fraction of whitefish muscle is soluble in 5-percent salt solution. As actomyosin becomes denaturated and insoluble in salt solution, it also loses some of its ability to combine with and hold the water in the muscle tissue of fish. As a result, the tissue becomes tough and unpalatable. The solubility of the fish-muscle protein in 5-percent salt solution under certain conditions, therefore, is a good measure of the degree of protein change. The development of the off-flavor related to fat spoilage and the

(over)

 ABSTRACTER: Martin Heerdt

8.59 ACID-SOLUBLE NUCLEOTIDES FROM THE BLOOD OF METAMORPHOSING SALMON

Svard, Per Olov (Institute of Zoophysiology, Uppsala, Sweden)
Nature 182, 1448-1449 (November 22, 1958)

In a search for possible precursors to the guanine that appears in large amounts in the skin of the salmon (Salmo salar) at the transformation from parr into smolt, blood samples from fishes in different stages of metamorphosis were collected and subjected to ion-exchange chromatography. The blood samples were obtained by cutting the tails of a number of fishes (as nearly equal in size as possible) and collecting the blood in a vessel cooled by a mixture of acetone and 'dry ice.' The frozen samples were extracted with 0.6 N and 0.3 N perchloric acid, neutralized by potassium hydroxide, and put on a 'Dowex 1' x 2 column in the formate form. The various fractions were eluted by the gradient elution technique of Hurlbert and his coworkers (1954) as modified by Schmitz (1954). Extinction values of each fraction were read at 260 and 280 mμ in a Beckmann spectrophotometer model DU. The various components were identified by their characteristics 260/280 mμ ratios, by their positions in the chromatograms and by their ultraviolet absorption curves. For further analysis appropriate fractions from the peaks in the chromatogram were pooled, desalted by passing through a 'Dowex 50' column, evacuated to dryness at 20° C., and finally dissolved in a small volume of distilled water. Using the millimolar extinction coefficients given by Hurlbert and coworkers the various compounds were estimated quantitatively. Base-ribose-phosphate ratios were based upon measurements of ultraviolet extinction values, analysis of total and acid-labile phosphate by the method of Berenblum and Chain, and analysis of ribose with the orcinol—hydrochloric acid method as modified by Hurlbert et al.

It is apparent that with respect to nucleotide content of the blood, metamorphosis can be

(over)

 Reprinted in whole

STORAGE OF FROZEN FOOD

EFFECT OF STORAGE TEMPERATURE

SALT FISH RESEARCH

SALMON BLOOD NUCLEOTIDES

3.2497

formation of free fatty acids, which are an indication of splitting of the fats and lipids, were readily correlated with taste-panel results.

Storage life.--Studies conducted mainly with cod and haddock showed the importance of storage temperature and time of storage. Sharp frozen, commercially wrapped fillets of cod, sole, redfish, and Atlantic halibut stored at -10° F. were as good as or better than fresh fish. With frozen halibut, this period of quality retention lasts 3 or 4 months at -10° F. Deterioration in quality occurs much more rapidly in frozen fish stored at 10° F. than it does in fish stored at 0° F. or at -10° F. Halibut and rosefish may remain satisfactory in quality for 18 months or more at -10° F., whereas plaice and cod deteriorate much more quickly. Storage temperatures of -10° F. or lower are necessary for long storage of frozen fish. Even at this temperature, the length of storage depends on the kind of fish stored.

Protein solubility curves almost paralleled the taste-panel scores for cod and plaice. The curves showed less correlation with halibut, however, and almost no change with redfish stored at -10° F. The development of free fatty acid showed, in general, a good correlation with storage life. Fatty acid development in frozen cod was very rapid. Almost no fatty acid was formed in redfish, and very little fatty acid was formed in halibut.

Storage temperature.--Refrigerator cars designed for frozen food often average about 15° to 18° F., whereas most cold-storage warehouses on the Atlantic Coast average about -10° F. So that the effect of this amount of variation in storage temperature could be measured, cases containing twenty-four 1-pound packages of commercially frozen cod fillets were stored at 0° F. for 1 month, were transferred to and held at 15° F. for 2 weeks, and then were returned to 0° F. storage. Immediately after storage at 15° F., the quality of these fillets was found to have dropped sharply, and thereafter the quality decreased at a rate similar to that of the control. Other cases of packaged fillets stored for 2 weeks at 15° F. after 3, 6, or 9 months of storage at 0° F. also showed a rapid decline in the taste-panel quality score. The net result of storage for 2 weeks at 15° F. was a shortening of the storage life by 2 to 2½ months as well as a marked reduction in quality. One week of storage at 15° reduced storage life by about 2 months, whereas a 3-day period of storage at 15° reduced storage life by about 1½ months.

3.249

shows that temperature variation has no special effect.

By defining the organoleptic point at which original "high quality" of the frozen food is lost in relation to steady temperatures from 0° to 30° F., the method can be used to estimate the change in quality during its irregular temperature experience, provided it is known, and to estimate the remaining "high quality life" of a product. In this manner, the effect of transportation and distribution patterns of temperature on the quality of frozen food can be determined.

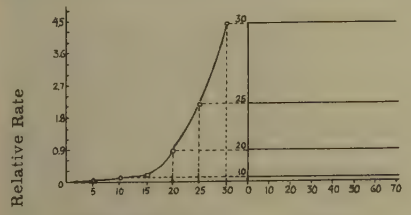

Figure 1.--Construction of a transformed coordinate system from a plot of relative rate of change versus temperature.

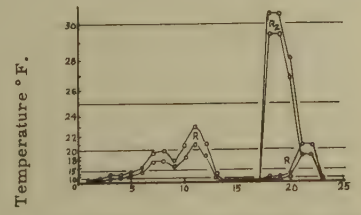

Figure 8.--Transportation and distribution patterns plotted on transformed coordinates constructed from data on ascorbic acid loss in strawberries. The two curves represent maximum and minimum rates for 95 percent of the lots tested.

8.59

divided into three time-periods. The first, or premetamorphosis period, is dominated by a high guanosine triphosphate and a low inosine monophosphate content. During this period there is no pronounced deposition of guanine in the skin. The next period, the metamorphosis period, is characterized by a high inosine monophosphate content of the blood, a high rate of guanine deposition, and a reduced guanosine triphosphate content of the blood. In the third or post-metamorphosis period the inosine monophosphate content of the blood has also been reduced to a low level, so that, with respect to nucleotide content, the blood is quite comparable with that of a nonmetamorphosing salmon.

A comparison with values for animal tissues given in the literature indicates that guanosine triphosphate occurs in remarkably high concentrations in the blood of the salmon, especially during the premetamorphosis period, when it amounts to about 30 percent of the adenosine triphosphate value. But also during nonmetamorphosing periods the guanosine triphosphate content of the blood of salmon is high as compared with, for example, muscle tissues, which have been reported by Bergkvist and Deutsch to contain guanosine triphosphate in amounts of about 1 percent of that of adenosine triphosphate. The corresponding figure for the blood of salmon is about 10 percent.

3.5

and stacking by mechanical means than are the metal tanks.

Other fields of investigation include (1) the mechanization of handling the fish from the dryer through packaging, (2) the development of containers to replace the traditional types of packages, and (3) the development of new products as processes for their production become available.

4.13 ISOLATION AND STRUCTURE OF THE C_{16} UNSATURATED FATTY ACIDS IN MENHADEN BODY OIL

Stoffel, Willy and Ahrens, E. H., Jr.
Journal of the American Chemical Society 80, 6604-6608 (December 20, 1958)

Introduction.--Smith and Brown, in 1945, were the first to note the presence of a C_{16} tetraene as a component of menhaden oil, and in 1958 Mangold and Schlenk confirmed the presence in menhaden oil of C_{16} mono-, di-, tri-, and tetraenes. The double-bond structure of the C_{16} polyenes, however, remained undefined until Shorland (1945) characterized all cis-n-hexadeca-7,10,13-trienoic acid in rapeseed oil and Silk and Hahn (1954) postively identified n-hexadeca-6,9,12,15-tetraenoic acid in South African pilchard oil.

Purpose.--The present report on C_{16} unsaturated acids is part of a large study to define the total fatty acid composition of menhaden body oil. Other considerations that demanded the isolation of pure polyenoic acids were (1) a need for extinction coefficients in the ultraviolet range after isomerization with alkali and (2) a need for other physical constants useful in the interpretation of gas-liquid chromatography patterns of highly unsaturated fatty acid esters.

Experimental.--To isolate and identify the polyenoic fatty acids of menhaden body oil, the most highly unsaturated acids were concentrated by low-temperature crystallization. This mixture then was resolved into homogeneous chain-length groups by fractional distillation at high vacuum, and each group was further subdivided by countercurrent distribution into monoene, diene, triene, and tetraene fractions. The precise double-bond pattern of the individual acids in each of these subgroups finally was determined by degradative studies. All steps were carried out under nitrogen if possible. Successful avoidance of artificial changes was verified at every stage: ultraviolet and infrared spectrography demonstrated the absence of conjugation or cis-trans isomerization of double bonds.

Degradations were carried out by oxidative and reductive ozonolysis. Lengths of the fragments from the carboxyl group to the nearest double bond, or the "carboxyl fragment," and of those portions

(over)

 ABSTRACTER: Martin Heerdt

6.14 COVERING STACKS OF CURED FISH MEAL

Stander, G. H.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 24 (1957)

Introduction.--To prevent precipitation of moisture on bags of fish meal stacked in the open and awaiting shipment, it is advisable to cover the stacks. The extent to which the covering of stacks with canvas sheets would, in practice, result in raised stack temperatures was investigated.

Experimental.--Eight hundred 100-pound bags of freshly produced full meal were placed upright, and touching, in a block about 40 feet long and 10 to 20 feet wide. The bags were left to cool for 4 days, during which period the ambient temperature varied between 58° F. and 84° F., and the relative humidity varied between 48 percent and 85 percent.

When at this stage the block was broken up, 320 bags were selected at random to build two identical stacks two bag-lengths wide, ten bag-widths long, and eight bags high. Each of the stacks measured 14 feet 6 inches by 5 feet by 5 feet 4 inches. The bag temperature in stack A varied from 80° F. to 97° F., averaging 86.4° F., and that in stack B varied from 82° F. to 98° F., averaging 88.0° F.

These stacks were left for 15 days, during which time the ambient temperature varied between 58° F. and 84° F., and the atmospheric humidity varied between 48 percent and 85 percent. At the end of this period, temperatures in stack A varied between 77° F. and 86° F., averaging 81.3° F., and those in stack B varied between 77° F. and 88° F., averaging 83.8° F.

At this stage, stack A was completely covered (top and sides) with canvas and left for 17 days,

(over)

 ABSTRACTER: June H. Olden

6.131 SOME TRENDS IN THE NORWEGIAN FISH MEAL AND OIL INDUSTRY

Anonymous
Norwegian Fishing News 5, No. 3, 6-8 (1958)

The daily output of fish meal and oil in Norway now is three or four times the prewar level. The total daily capacity is 40,000 tons of raw material per day. In addition to its enlarged capacity, the industry has achieved high technical standing for both its quantity and its quality of production. Among the factors that have contributed to the development of the fish meal and oil industry are (1) fundamental and practical research carried out by central research organizations and (2) the design and construction of new machinery by manufacturers who specialize in this field.

The most important results from research have been (1) the development of a low-cost chemical method for the preservation of glut landings, (2) the determination of chemical composition and biological value of stickwater and development of methods for its recovery, (3) improvement of drying method, and (4) a general improvement in the quality of the products.

Soon after the war, a Norwegian firm and a Swedish firm cooperated in the development of a special system for the recovery of stickwater. The stickwater is evaporated under pressure just high enough to make the vapor leaving the last effect of the evaporator useful for other purposes. Properly balanced, this system makes it possible to concentrate stickwater without the consumption of additional steam. To eliminate the adverse effect of high temperature on certain nutrients, the method has been modified to combine vacuum evaporation with the pressure system. The first effect, which works under moderate pressure, is large enough to supply steam both to the cooker and to the following effects of the evaporator.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

6.14 STORAGE OF STICKWATER CONCENTRATE

Dreósti, G. M. and Lewis, A. M.
Annual Report, Fishing Industry Research Institute, April-December 1956, Cape Town, South Africa, 10, 30-31 (1957)

Purpose.--Factors affecting the storage life of stickwater concentrate were studied.

Material.--The two concentrates used were produced by (1) a triple-effect vacuum concentrator and (2) a triple-effect concentrator with pressure in the first effect and vacuum in the other two effects.

Procedure.--Samples were placed in sterilized glass jars fitted with rubber stoppers, through each one of which a leg of a mercury manometer was fitted. The jars were placed in an incubator at 80° F.; and after 48 hours, when the jars and their contents had attained incubator temperature, the manometers were adjusted to show a pressure of 0.5-inch mercury in the jars.

Preliminary results.--In all cases, the pressure in the jar initially dropped to below that of the atmosphere, to 0.5-inch mercury vacuum, within the first few days; in some cases, a vacuum of more than 3 inches mercury was reached after 40 days.

Samples that maintained a vacuum were, on opening, in sound condition, whereas samples that developed a pressure showed a reddish discoloration and had an offensive odor.

Results with controls (no treatment).--Both samples of concentrate 1 developed a pressure approximately ½-inch mercury above atmosphere after 11 days. One sample of concentrate 2 developed

(over)

 ABSTRACTER: June H. Olden

6.131

The trend in Norway has been toward twin-screw presses because of their superior performance on soft raw material. With the two screws rotating in opposite directions, there is no opportunity for the material to rotate with the screw, and the material travels straight forward as intended.

A new patented spiral press utilizes a unique pressing principle. The press consists of two rotary strainer wheels mounted on each side of a stationary multicoiled spiral. The distance between the coils of the spiral diminish toward the circumference of the strainer wheels. The distance between the wheels is small and constant and represents the thickness of the press cake. The combination of the strainer wheels and the spiral form a continuous channel for the material, with a decreasing cross-section area from the center toward the periphery. The cooked raw material is conveyed by the feeding screw to the center of the spiral channel, and by means of the rotating wheels, it is moved outwards through the spiral. The liquid drains away from both sides of the press cake. This press is unique in that it works well on rather thin suspensions that run unchanged through ordinary screw presses.

6.14

a pressure after 120 days; the other was still sound after 6 months. When concentrate 1 was increased to 47.3 percent total solids (vacuum concentration at 45° C.), the time taken to develop a pressure approximately $\frac{1}{2}$-inch mercury above atmospheric was increased from 11 days to 45 days. After samples of concentrate 2 were diluted with boiled distilled water to 41.9 percent total solids, they developed pressure after 90 days.

Results with sodium benzoate.--The addition of sodium benzoate in a proportion designed to give 200 p.p.m. on the basis of 10 percent moisture content did not improve the storage life.

Results from acidifying.--The pH of samples of both concentrates 1 and 2 was reduced to 5.0 and 4.4, respectively, by the addition of concentrated sulfuric acid. After 9 months of storage at 80° F., all the samples were still in good condition. Different concentrates require different amounts of acid to reduce their pH. For example, concentrate 2 required a considerably greater quantity of acid to obtain the desired pH than did concentrate 1.

4.13

between double bonds, or the "intermediate fragments," were identified after converting these portions of the molecule to dicarboxylic acids by oxidative ozonolysis. In this process, the fragment from the methyl group terminal to its nearest double bond, or the "terminal fragment," is converted to the monocarboxylic acid. After separation of mono- from dicarboxylic acids, the individual dicarboxylic acids were isolated, identified, and quantitated. The terminal fragments also were converted to aldehydes by reductive ozonolysis, and these aldehydes were identified as 2,4-dinitrophenylhydrazones. Gas-liquid chromatography was the most valuable chromatographic procedure used for separating and measuring the fragments.

Results.--See tabulated data below.

Summary of results of degradative studies on C_{16} unsaturated fatty acids of menhaden body oil.

Fraction	Oxidative ozonolysis mono- and dicarboxylic acids	Moles	Reductive ozonolysis 2,4-dinitrophenylhydrazones of	Moles	Structure indicative by degradative data
C_{16} tetraenoic acids	Adipic	0.90	acetaldehyde[a]	2.43	n-hexadeca-6,9,12,15- and (trace) -4,7,10,13-tetraenoic acids
	malonic	2.04			
	succinic	Trace			
C_{16} trienoic acids	adipic	0.58	butyraldehyde	0.42	n-hexadeca-6,9,12- and -7,10,13-trienoic acids
	pimelic	0.12	propionaldehyde	0.11	
	malonic	1.15	acetaldehyde[a]	1.04	
C_{16} dienoic acids	adipic	0.16	butyraldehyde	0.57	n-hexadeca-6,9- and 9,12-dienoic acids
	azelaic	.59			
	malonic	.74	acetaldehyde[a]	0.55	
	heptylic				
C_{16} monoenic acids	suberic	.15			n-hexadeca-8- and -9-monoenoic acids
	capyrlic	.15			
	azelaic	.85			
	heptylic	.85			

[a] Results as a secondary reaction product by decomposition of malonic dialdehyde.

6.14

during which time the ambient temperature varied between 51° F. and 84° F., and the relative humidity varied between 40 percent and 89 percent. At the end of this period, both stacks were broken up, and bag center temperatures were taken.

Results.--Covering delayed the rate of cooling of stack A. Seventeen days after stack A was covered, the temperature had dropped from 81.3° F. to 79.1° F., whereas the average temperature of stack B had dropped from 83.8° F. to 74.6° F. Furthermore, the maximum temperature recorded in stack A, 86° F., was 5° F. higher than the maximum in stack B.

6.195 THE TYROSINE CONTENT OF FARM FEEDS

Lyman, Carl M.; Camp, B. J.; and Tiller, Helen M. (Texas Agricultural Experiment Station, College Station)
Journal of Agricultural and Food Chemistry 6, 767-770 (October 1958)

Even though tyrosine is not one of the essential amino acids, tables listing the essential amino acid content of feedstuffs are not entirely complete without data on tyrosine. The quantitative requirements of animals for phenylalanine are greater if tyrosine is not present in the diet.

One difficulty in determining the content of tyrosine in materials that contain carbohydrate is that tyrosine is destroyed during acid hydrolysis. For this reason, alkaline hydrolysis is preferred by most investigators. Even alkaline hydrolysis, however, has been found not to stabilize tyrosine satisfactorily during assay.

The purpose of the work reported in this paper was to develop a new method for stabilizing tyrosine during the hydrolysis of feedstuffs containing carbohydrates and to collect data on the tyrosine content of feedstuffs and materials with potential value as farm feedstuffs.

Both tryptophan and tyrosine react with carbohydrates when boiled in acid solution. Dark-colored humin materials are formed, which contain nitrogen derived from these amino acids. The reaction between carbohydrate and tryptophan apparently is considerably faster than the reaction between carbohydrate and tyrosine. By increasing the concentration of tryptophan to many times that of tyrosine, the reaction is shifted toward tryptophan so that for all practical purposes the tyrosine is left completely free. This is the basis for the stabilization of tyrosine reported in this paper.

The tyrosine content of various feedstuffs and potential feedstuffs is reported in tabular form. The data on fishery products are reproduced here (see over).

(over)

 ABSTRACTER: Kathryn L. Osterhaug

6.84 EXPLORATORY RAT AND CHICK BIOASSAYS OF SCALES FROM OCEAN PERCH AND HERRING AS ANIMAL FEED

Lemack, N. I.; Livingston, G. E.; Parkinson, L. R.; Fellers, C. R.; and Anderson, D. L. (University of Massachusetts, Amherst)
Food Research 23, 684-692 (November-December 1958)

Purpose.--This investigation was made (1) to find a practical means for utilizing fish scales in the manufacture of animal feed and (2) to determine if the resulting product could be fed to animals.

Experimental.--Scales from Atlantic herring (Clupea harengus) free of guanine and scales from ocean perch (Sebastes marinus) were collected and dried at 60° C. Hydrolysis of the dried scales was carried out with different concentrations of enzymes, H_2SO_4, and NaOH and at different ratios of fish scale to water. With a fish scale-to-water ratio of 1 to 50, NaOH at a pH of 9.7 resulted in 47.6-percent hydrolysis, whereas 10-percent NaOH resulted in 57.8-percent hydrolysis and 5-percent H_2SO_4 resulted in 57.2-percent hydrolysis. A 0.48-percent pepsin solution used at a pH of 1.0 to 2.0 and at a 10-percent level of fish scale solids resulted in 98-percent hydrolysis after incubation for 20 hours at 37° C.

Hydrolyzates and feeding studies.--All hydrolyzates used in the feeding studies were fully neutralized, concentrated by first boiling off the bulk of the water in an open kettle, dehydrated at about 60° C., and ground in a hammer mill prior to use. In study one, the control diet had casein as the sole source of protein; the first experimental diet had neutralized, dried, and ground ocean perch hydrolyzate as the sole source of protein, and the second experimental diet had dried, ground (untreated) ocean perch scales as the sole source of protein. Three groups of 14 albino rats each were used in this 42-day assay, which was carried out according to the paired-feeding technique of Mitchell and Beadles. In study two, the control diet consisted of commercial steam-dried fish meal

(over)

 ABSTRACTER: Martin Heerdt

6.52 STATUS OF THE ANIMAL FOOD FISHERY IN NORTHERN CALIFORNIA, 1956 AND 1957

Best, E. A.
California Fish and Game 45, 5-18 (January 1959)

Three processing plants located at Fields Landing, Fort Bragg, and Oakland, California, are currently processing most of the trawl-caught whole fish that are sold for use as animal food in California.

On ocean fishing grounds where species of fish are mixed, the otter trawl is not selective. The current seafood markets, however, are highly selective in regard to the species of fish they will purchase. The fisherman, consequently, is confronted with the problem of disposing of unmarketable fish. In the past, and to some extent even now, the portion of the catch that could not be sold for human food was disposed of at sea. Recently, however, the use of these unmarketable species has created a new industry in most areas where otter trawling is practiced. Unsalable species, "trash fish," are used as fresh-frozen or processed food for domestically reared fur bearers and for pets or are reduced into meal.

Processing.--The most economical processing of trash fish depends on the availability of large quantities of raw material and on rapid handling. The fish are unloaded from the vessel, weighed, and dumped into an elevator that transports them to a washer. A second elevator moves the fish from the washer to a large food grinder. The ground fish drops into a hopper that serves as a reservoir to feed a specially designed pump. The pump transfers predetermined amounts of the ground fish into waxed boxes, and the fish material is then frozen for storage.

(over)

 ABSTRACTER: Kathryn L. Osterhaug

8.64 VITAMIN B_{12} IN MARINE FISH

Braekkan, Olaf R. (Norwegian Fisheries Research Institute, Bergen, Norway)
Nature 182, 1386-1387 (November 15, 1958)

In the course of a comparative investigation of the vitamin contents of different organs from fish, a rather interesting relative distribution, and in some cases unusually high concentrations, of vitamin B_{12} were observed. As the importance of vitamin B_{12} in marine ecology has been emphasized in recent reports, a brief account of the main findings is given in this communication.

Vitamin B_{12} was determined by microbiological assays with Lactobacillus leichmannii. To ensure that the growth-promoting activity measured was derived from vitamin B_{12}, checks were carried out by paper chromatography.

Although most organs have been investigated the complete results cannot be reported here. In table 1 (see over) are shown the results of analyses of: muscle, kidney, liver and heart from some species. The most striking results are the frequent high values for vitamin B_{12} in the heart: single values up to 5 μgm. vitamin B_{12} per gm. fresh weight (20.8 μgm. per gm. dry weight) were found in hearts from the pollack (Gadus pollachius). So far as we know such high concentrations are very unusual in any natural source.

Another interesting result was the relation between the vitamin B_{12} content of liver and heart. In some cases the heart showed up to 150 times the value for the liver in the same fish. Normally, kidney and liver are recognized as the organs richest in vitamin B_{12}, but the present findings show that in fish the heart often contains the highest concentration. Tarr et al. found in the kidney of the sockeye-salmon 18 μgm. vitamin B_{12} per gm. solids. Several other organs from this fish were

(over)

 Reprinted in whole

6.52

Species used.--Arrowtooth halibut, hake, and sablefish made up 75 percent of the total poundage of whole fish landed for animal food in California during 1956 and 1957. Rex sole and Dover sole were utilized in limited amounts. Rockfish species that were not acceptable to the fresh fish trade were used in varying amounts. Market orders for fresh fish influenced the amount of rockfish landed as animal food.

Practically all fishes are usable with the exception of sharks and rays. The plants require that all fish be fresh when received, which necessitates icing at sea if the fishing trip is for a longer period than 1 day. Some fishermen bring in only the trash fish caught on the last day of an extended fishing trip. No California fishermen are fishing solely for the animal-food market, but use this industry to supplement their income from market fish.

8.64

also investigated, but unfortunately not the heart. In none of the species I investigated were such values for kidneys encountered.

So far the general picture seems to be that undernourished fish with very fat livers show low values for vitamin B_{12} in the livers and often very high values for the heart. Fat fish with 'normal' livers usually show the highest values for this organ, although high concentrations are also encountered in the hearts.

The results from the plaice (Pleuronectes platessa) deserve some comments. This fish lives in shallow waters where both the sea and most of its food may be expected to contain relatively high concentrations of vitamin B_{12}. It is therefore interesting to note the relatively high average value for the liver from this fish. Actually, in one of the samples from plaice the liver contained 8 μgm. vitamin B_{12} per gm. fresh weight (50 μgm. per gm. fat-free dry weight).

The results emphasize the position of the fish in the turnover of vitamin B_{12} in marine life. A detailed account of this work will be published elsewhere.

Table 1.--The vitamin B_{12} content of some organs from fishes.

Species	μgm. vitamin B_{12} per gm. fresh weight			
	Muscle	Kidneys	Liver	Heart
Cod (Gadus morrhua)	0.005	0.045	0.045	1.85
Coalfish (Gadus virens)	0.035	0.070	0.14	0.50
Pollack (Gadus pollachius)	0.018	0.16	0.33	4.25
Haddock (Gadus aeglefinus)	0.018	0.32	0.067	2.58
Ling (Molva molva)	0.006	0.20	0.11	0.26
Tunny (Thunnus thynnus)	0.037	0.35	3.53	0.85
Plaice (Pleuronectes platessa)	0.022	0.37	5.00	0.81

6.195

Tyrosine Content of Farm Feeds and Materials with Potential Values as Feed Ingredients

Product	No. of samples	Average crude protein, %	Average tyrosine content, %	
			Sample	Crude protein
Fish meals				
Anchovy meal	1	58.72	2.16	3.66
Flounder meal	1	56.48	1.57	2.78
Herring fish meal, Canadian	1	73.00	2.56	3.51
Herring full meal, Canadian	1	72.06	2.12	2.94
Herring full meal, Norwegian	1	66.59	2.26	3.39
Menhaden fish meal	3	61.21	1.97	3.21
Pilchard full meal	1	63.87	2.07	3.24
Redfish meal	2	58.50	1.90	3.25
Sardine meal	1	53.97	1.79	3.32
Sardine fish meal, Chilean	1	69.59	2.32	3.33
Sardine waste fish meal	1	59.35	1.94	3.27
Tuna fish meal	2	60.80	2.07	3.40
White fish meal	1	69.06	2.33	3.37
Crab meal	1	36.87	1.40	3.80
Fish solubles				
Condensed fish solubles	2	69.12	0.61	0.88
Condensed menhaden fish solubles	1	64.66	0.87	1.35
Menhaden fish meal with solubles	1	61.87	2.23	3.60
Dry fish solubles on alfalfa meal carrier	1	39.26	0.61	1.55
Desiccated and defatted fish meal	1	80.30	2.65	3.30
Desiccated, defatted, and deodorized fish flour	1	79.60	2.79	3.51
Fish glandular and liver hydrolyzate	1	63.66	1.80	2.83

6.84

as the sole source of protein; and the experimental diets contained fish meal to the extent of 70 percent of the protein supply, with either ocean perch or herring scales contributing the remaining 30 percent. Three groups of 6 albino rats each were used in this 42-day assay. In study three, a 90:10 fish-meal fish scale ratio was used. All diets were devised (1) to be nutritionally complete (except for protein in experimental diets), (2) to be isocaloric, and (3) to provide a protein level of 9 or 10 percent.

One-day-old male broiler chicks in groups of 16 chicks each received two control and four experimental diets for 3 weeks. Control diets consisted of (1) a ration in which soybean meal served as the main source of protein and (2) a ration in which fish meal served as the main source of protein. Experimental diets 1 to 4 contained 50, 50, 75, and 75 percent fish meal, respectively. The remainder of diets 1 to 4 contained 50 percent ocean perch scales, 50 percent herring scales, 25 percent ocean perch scales, and 25 percent herring scales, respectively. All diets were nutritionally complete, except for the protein in the experimental diets, and had a calculated protein content of 15 percent.

Results.--Results obtained in the first rat bioassays indicated that both the hydrolyzate and the raw ocean perch scales as used were inadequate sources of protein for the maintenance of life. Results obtained in the second rat bioassay indicated that fish scales either from ocean perch or from herring, when added to fish meal in quantities such as to represent 10 percent of the meal protein, under the experimental conditions used, showed no evidence of any adverse effects on the growth value of the meal. Results obtained in the third rat bioassay indicated that the addition of herring scales to fish meal to the extent of 30 percent of the meal protein appeared to have a slight adverse effect on the nutritive value of the meal. A similar addition of ocean perch scales showed an even greater adverse effect.

No significant difference was apparent at the 5-percent level between the rates of growth of the chicks on the control diets and the rates of growth of chicks on eigher the 75:25 fish meal-ocean perch scale diet or the 75:25 fish meal-herring scale diet. A significant difference, however, did appear between the rates of growth of the animals on the control diets and of those on either of the 50:60 fish meal-fish scale diets.

0.321 STUDIES ON THE BIOCHEMICAL CHANGE IN FISH MUSCLE

Saito, Kaname; Hidaka, Tomio; and Sameshima, Muneo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 3, 196-200 (1958) (English abstract, tables, and figures)

VII. On the viscosity change and superprecipitation of the myosin A and B fractions caused by ATP addition. --The authors prepared the protein fractions corresponding to myosin A and myosin B not only from several fishes but also from rabbit and examined the viscosity change and superprecipitation these preparations showed on ATP addition. The results suggest that the myosin A fraction of fishes behaves to ATP like rabbit actomyosin.

VIII. On the proteolytic activity of fish muscle extracts. --Ibid. 201-204. The present paper deals with the proteolytic activity shown by muscle extracts of carp, mackerel, and shark.

0.322 ON A SPECIFIC BEHAVIOUR OF "MYOSINS" OF SQUID MUSCLE
I. PRECIPITABILITY OF "MYOSINS"

Migita, Masao; Matsumoto, Juichiro J.; Aoe, Norimichi; and Saishu, Tomiko
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 1, 51-58 (1958) (English abstract, table, and figures)

Myosins of squid become less precipitable, unless the extract is diluted immediately after extraction. This change is more marked in media of pH higher than 7, and when the used muscle is not fresh. Consequently, in the determination of myosins in squid muscle, myosins should be precipitated immediately after extraction and at pH near and not exceeding 7.

0.33 BROWNING AND THE AMADORI REARRANGEMENT

Nordin, Philip and Kim, Yee Sik (Kansas Agricultural Experiment Station, Manhattan)
Journal of Agricultural and Food Chemistry 6, 765-766 (October 1958)

This investigation was made to determine whether or not the Amadori rearrangement occurs in dilute aqueous solution, a condition unfavorable to the formation of the nitrogen-substituted aldosylamines--the initial products of condensation.

The browning of glucose with alanine, glycine, and phenylalanine in solution was compared with the browning of the Amadori-rearrangement products of glucose and the corresponding amino acids. The rates of browning and the development of ultraviolet spectra were recorded for these systems. The amount of Amadori-rearrangement products formed in a system was measured. Results confirm that browning does proceed through the Amadori rearrangement in dilute solutions. However, other factors also contribute to nonenzymatic browning.

0.33 STABILITY OF SOME N-GLUCOSIDES OF AMINO ACIDS AND PEPTIDES IN AQUEOUS SOLUTIONS

Kaverzneva, E. D. and Kalis, V. E. (N. D. Zelinskii Institute of Organic Chemistry, Academy of Sciences, USSR, Moscow)
Biochemistry 23, 87-94 (January-February 1958)

The Na salts of the N-glucosides of glycine, serine, and diglycine are hydrolyzed to a certain equilibrium state in buffer solutions of pH ~5.5, ~7.7, ~9.8, and ~10.5 at ~20°. The rate at which equilibrium is reached and the composition that prevails at the state of equilibrium is different for each salt and for each pH value of the solution. The equilibrium shifts toward the glucoside when the concentration of N-glucoside is increased.

0.38 EFFECTS OF METAL IONS ON THE GLYCYLGLYCINE DIPEPTIDASE

Togasawa, Yoshihisa and Katsumata, Teizo
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 10, 625-631 (1958) (English abstract and figures)

VII. On the interaction between glycylglycine derivatives and Co^{++}, Mn^{++}, and Mg^{++}. --The activation effects of metal ions such as Co^{++}, Mn^{++}, and Mg^{++} were investigated by using sarcosylglycine, N-dimethylglycylglycine, glycylsarcosine, and glycylglycinamide from pyloric caeca of tuna, bonito, and yellowtail as substrates.

0.38 EFFECTS OF METAL IONS ON THE GLYCYLGLYCINE DIPEPTIDASE

Togasawa, Yoshihisa
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 3, 186-190 (1958) (English abstract, tables, and figures)

IX. On the states of Mg in enzyme solution of pyloric caeca. --Two different forms of Mg as measured by chelate titration were found to be present in bonito pyloric caeca. One was measurable directly in the enzyme solution; the other was measurable only in the ash of the solution.

X. On the mechanism of Mg^{++} participation in the formation of active glycylglycine dipeptidase. --Ibid. 191-195. GG dipeptidase of pyloric caeca is a metal protein that contains Mg. Dilution of the enzyme solution advances the dissociation of the protein-Mg compound, and favors the reaction, protein-Mg $\rightleftarrows$ Mg (ion or salt) + protein to progress toward the right. When Mg^{++} is added the reaction proceeds towards the left, resulting in an increase of active form of the enzyme.

1.85 SURVEY OF THE UNITED STATES SHRIMP INDUSTRY

Anonymous
Special Scientific Report: Fisheries No. 277, 311 pp. (November 1958) (United States Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.)

This report published in two volumes provides a comprehensive examination of the shrimping grounds, vessel construction, fishing operations, fishing costs, processing-plant efficiency, processing costs, trends in distribution, packaging, storing, shipping, per capita consumption, prices, wholesaling, retailing, merchandising, and consumer preferences.

A chapter on conclusions and recommendation finds that the shrimp industry's welfare can be safeguarded best (1) by increasing the efficiency of operations at all levels and thus effecting cost savings in shrimp production, processing, and distribution and (2) by stabilizing markets.

1.85 CONTROLLED CULTURE OF SHRIMP SEEN ON HORIZON ON A COMMERCIAL SCALE

Anonymous
Frosted Food Field 26, 1, 9, 10 (June 1958)

(Abstract of this article appears under 9.16 page 19 - February 1959)

CONVERSION UNITS

1 pound = 453.59 grams
1 ounce = 28.350 grams
1 inch = 2.5400 centimeters
1 gallon = 128 ounces
1 gallon = 231 cubic inches
1 quart = 0.9463 liters
1 ounce = 29.573 milliliters

CONVERSION OF TEMPERATURE SCALES

$F = 9/5\ C + 32$

$C = 5/9\ (F - 32)$

SPECIFIC HEAT AND HEAT OF FUSION

Average values of specific heat generally used for fishery products are 0.80 B.t.u. per pound per °F. above freezing and 0.40 B.t.u. per pound per °F. below freezing.

An average heat of fusion generally used for fishery products is 115 B.t.u. per pound. The heat of fusion of ice is 144 B.t.u. per pound.

DEFINITIONS

calorie	heat required to raise the temperature of 1 gram of water 1 degree Centigrade
British thermal unit	252 calories or the heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit
ton of refrigeration	removal of heat at the rate of 12,000 B.t.u. per hour
atmospheric pressure, normal	a pressure at sea level of 14.696 pounds per square inch, absolute
sensible heat	heat added to the body when its temperature is changed
latent heat	heat absorbed or evolved during a change of state, with no change of temperature
heat of fusion	heat absorbed when a solid melts, with no change of temperature
heat of vaporization	heat absorbed when a liquid vaporizes, with no change of temperature
heat of reaction	heat evolved or absorbed during a chemical reaction
heat transmission	flow of heat by conduction, convection, or radiation, singly or in any combination
horsepower	work performed at the rate of 550 foot pounds per second
mechanical equivalent of 1 B.t.u. of heat	heat given off by a total expenditure of 778 foot pounds of energy

COMMON ABBREVIATIONS*

A.	Ångstrom unit(s)
a.c.	alternating current
alc.	alcohol, alcoholic
alk.	alkaline (not alkali)
amp.	ampere(s)
anhyd.	anhydrous
aq.	aqueous
at.	atomic (not atom)
at. wt.	atomic weight
Bé.	Baumé
biol.	biological
B.O.D.	biochemical oxygen demand
b.p.	boiling point
B.t.u.	British thermal unit(s)
cal.	calorie(s)
cc.	cubic centimeter(s)
cm.	centimeter(s)
d.	density (d_{13} specific gravity at 13° referred to water at 4°; d^{20}_{20}, at 20° referred to water at the same temperature)
d.c.	direct current
e.m.f.	electromotive force
Et	ethyl (Et_2O, ethyl ether)
e.v.	electron volt(s)
f.p.	freezing point
ft.	foot, feet
g.	gram(s)
γ	microgram(s)
hr.	hour
in.	inch(es)
kcal.	kilocalorie(s)
kg.	kilogram(s)
kv.	kilovolt(s)
kv.-amp.	kilovolt-ampere(s)
kw.	kilowatt(s)
kw.-hr.	kilowatt-hour
l.	liter(s)
lb.	pound(s)
m.	meter(s); also (followed by a figure denoting temperature) melts at, melting at
M.	molar (as applied to concn.)
ma.	milliampere(s)
Mc.	megacycle
mc.	millicurie
Me	methyl (MeOH, methanol)
meq.	milliequivalent
m.e.v.	million electron volts
mg.	milligram(s)
ml.	milliliter(s)
mm.	millimeter(s)
mγ	millimicrogram
mμ	millimicron(s)
mol.	molecule, molecular
mol. wt.	molecular weight
m.p.	melting point
μ	micron(s)
mv.	millivolt(s)
n	index of refraction (n_D^{20} for 20° and sodium light)
N	normal (as applied to concn.)
petr. ether	petroleum ether
p.p.m.	parts per million
ppt.	precipitate
pptd.	precipitated
pptg.	precipitating
pptn.	precipitation
qual.	qualitative (not qualitatively)
quant.	quantitative (not quantitatively)
r.p.m.	revolutions per minute
sol.	soluble
soln.	solution
sp. gr.	specific gravity
sp. heat	specific heat
sp. vol.	specific volume
sq. cm.	square centimeter(s)
U.S.P.	United States Pharmacopeia
v.	volt(s)
vol.	volume (not volatile)
w.	watt(s)
wt.	weight

* These abbreviations are used by Chemical Abstracts and, accordingly, have wide recognition.

2.111 THE STUDY ON THE COLOR OF FISHING NET I. OBSERVATIONS ON THE PASSAGE OF FISHES THROUGH A COLORED NET

Kanda, Kenji; Koike, Atushi; and Ogura, Mitio
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 10, 612-616 (1958) (English abstract, figures, and table)

The fish-barring effect of a colored net decreased almost always in the following order: red > yellow > green, while black, gray, and white produced different effects according to the species of fish.

II. Behaviours of fish schools in the neighborhood of a colored net.--Ibid. 617-620.

III. Effect of the depth of color of a net on the behaviour of a fish school near the net.--Ibid. 621-624. In the day time, the behaviour of a fish school near a colored net is influenced more strongly by wave length than by intensity of the light reflected by net cords.

IV. A change in illumination affecting the behaviour of a fish school near a colored net.--Ibid. 680-683. The wave length of the light reflected by the net is influential in the day time; whereas both the kind and the depth of color of the net affect the fish behaviour in twilight.

2.111 EXPERIMENTS TO SEE THE EFFECT OF COLOR AND ITS DEPTH ON THE DRIVING NET BY THE CENTRALIZING METHOD

Kusaka, Takaya
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 12, 766-769 (1958) (English abstract, figures, and tables)

The author has studied the effect of colored vinyl cord as a model net for driving fish.

2.116 AN ATTEMPT TO DETERMINE THE SWIMMING SPEED OF FISH SCHOOLS WITH THE FISH FINDER--PRELIMINARY REPORT

Kawada, Saburo; Tawara, Yozo; and Yoshimuta, Chosei
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 1, 1-4 (1958) (English abstract, figures, and table)

In a field test that was carried out at night with a set net commercially operated, the swimming speed of schools of horse mackerel swimming in and out of the net has been estimated to range from 0.05 to 0.55 m/sec.

2.116 DISTANCES OF THE SEA CLUTTER ECHOES THAT INTERFERE WITH RADAR WATCHING BY MEANS OF CORNER REFLECTORS

Saito, Shoji and Fujii, Takeji
Bulletin of the Faculty of Fisheries Hokkaido University 9, No. 1, 48-52 (May 1958)

In this experiment, a Kelvin & Hughes Marine Radar Type 2 was used on the 4M range only. Photographs of Limit Lines were obtained and measured. The reflector could be detected with ease without operating the clutter circuits, provided that it was kept at a considerable distance from the Limit Lines.

3.12 EFFICACY OF SOME ANTIBIOTICS AS PRESERVATIVES FOR FRESH TUNNY

Takatsuka, Noboru; Tawara, Tadashi; and Ono, Hokoto
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 3, 221-226 (1958) (English abstract, tables, and figures)

Chlortetracycline, tetracycline, and oxytetracycline are effective as preservatives for keeping tunny flesh in a good state.

3.12 THE CHLORTETRACYCLINE (CTC) CONTENT OF TRAWL CATCH TREATED ON BOARD AND RESIDUAL CTC IN EDIBLE PART ON COOKING AND PROCESSING OF TREATED FISH

Tomiyama, Tetua; Yone, Yasuo; and Tsuda, Atsushi
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 9, 572-578 (1958) (English abstract, figures, and tables)

Various fish caught by trawl were placed under CTC ice (3.5 p.p.m.) or dipped in CTC sea water (10 p.p.m.) immediately after catching and stored aboard the trawler. The skin of cutlass fish, butterfish, croaker, lizard fish, sea eel and harvest fish contained 0.11 mcg. CTC per gram on an average after 22 days of storage, whereas the flesh contained only 0.08 mcg. CTC per gram on an average. Except for boiled lizard fish, broiled sea eel, and fried cutlass fish, residual CTC was not detected in five species cooked in four different ways.

3.239 STUDIES ON PROTEIN DENATURATION IN FROZEN FISH PARTS I, II, AND III.

Ironsides, J. J. M. and Love, R. M.
Journal of the Science of Food and Agriculture 9, 597-617 (September 1958)

(Abstract of this article appears under 3.2495 page 3 - April 1959)

3.239 ON THE FORMATION OF AMINE IN FISH MUSCLE VII. EFFECT OF FREEZING ON THE HISTAMINE FORMATION IN THE THAWED FISH MUSCLE

Ota, Fuyuo and Kaneko, Kosuke
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 2, 140-143 (1958) (English abstract and figures)

The appearance of histamine was delayed and depressed in thawed muscle, whereas no appreciable difference between the thawed and fresh muscles was observed in the course of deterioration judged by the increase of ammonia and mercuric chloride reaction. The depression effect of freezing varied according to the storage period or temperature, and little histamine was produced in the fish thawed after being frozen for a long time or at a lower temperature.

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring, Blueback, glut herring, shad herring	Pomolobus pseudoharengus Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic) Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic) Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic) Clupea pallasii (Pacific)
Thread		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic) Pneumatophorus diego (Pacific)
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic) Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England) Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic) Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South) Penaeus duorarum (Atlantic) Penaeus aztecus and Xiphopeneus kroyeri Gulf) Pandalus species (Atlantic and Pacific) Pandalopsis species (Pacific) Crago species (Pacific)
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic) Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic) Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic) Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

3.2497 THAW INDICATOR FOR FROZEN FOODS

Zopf, Geo. W., Jr. (Monsanto Chemical Co.)
U. S. Patent 2,762,711 (Sept. 11, 1956)
Chemical Abstracts 52, 5697 (April 10, 1958)

Thaw indicators are prepared by mixing clays with an aromatic amine and HCHO (formaldehyde). The resultant products usually have yellow or blue colors when dry, which change to green on moistening with water but not on contact with ice.

3.2497 BIOCHEMICAL CONDITIONS OF WHALE MEAT BEFORE OR AFTER FREEZING AND COLD STORAGE OF FROZEN MEAT

Tanaka, Kazuo and Tanaka, Takeo (Tokyo Univ. Fisheries, Kurihama)
J. Tokyo Univ. Fisheries 42, 83-8 (1958)
Chemical Abstracts 52, 20744e (November 25, 1958)

The H_2O content of whale meat was studied to improve its frozen storage and palatability after thawing; 56 percent of the H_2O in whale meat should be stored at temperatures as low as possible (-10° to -20°) and kept for 5 to 10 days at -2° or -3° just before thawing.

3.337 THERMAL PROCESSING CHARACTERISTICS OF CANNED NON-COMMINUTED MEATS

Schack, W. R.; Greenberg, R. A.; Blodgett, G. A.; and Silliker, J. H. (Swift and Company, Research Laboratories, Chicago, Illinois)
Food Research 24, 112-118 (January-February 1959)

The Fc (F_0) value of Ball does not appear to describe adequately the spore-killing potential of a specific thermal process in canned non-comminuted meats. The Stumbo Fs and layer concepts appear to apply more directly to this type of product than does the Ball concept. They also may apply in other conduction-heating products where contamination is normally concentrated at the external surfaces. Nineteen references are cited.

3.337 PHYSICOCHEMICAL PROPERTIES OF MARINE PRODUCTS AND RELATED SUBSTANCES

Kishimoto, Akira and Fujita, Hiroshi (Kyoto Univ., Maizuru, Japan)
Nippon Suisangaku Kaishi 22, 306-10 (1956-57) (In English)
Chemical Abstracts 52, 13132 (August 10, 1958)

V. Heat conductivity of fresh fish meats.

3.4 TREATMENT OF FISH

Van Hees, G. m. b. H.
Ger. 853,245 (Sept. 6, 1956)
Chemical Abstracts 52, 13140 (August 10, 1958)

Salts of phosphoric acids such as ortho-, pyro-, meta-, and polyphosphates are added to skinned, boned, and shredded fish meat to make possible the production of fish sausage similar to meat sausage.

3.4 CHANGES IN CONCENTRATION OF VITAMIN B_1 AND B_{12} IN FLATFISH DURING THE SMOKING PROCESS

Oka, Kazuko and Tanaka, Mizuho (Nagasaki Women's Coll.)
Kasei-gaku Zasshi 9, 17-21 (1958)
Chemical Abstracts 52, 18950 (November 10, 1958)

3.4 FISH PROCESSING STREAMLINED IN NEW ROSS FACTORY

Anonymous
Food Manufacture 34, 51-55 (February 1, 1959)

The core of the factory is a battery of four Torry fish-smoking kilns. A striking feature of the plant is the high degree of mechanization achieved, which covers such operations as the filleting and splitting of haddock and herring, the disposal of offal, and the packing of the final product. The layout is such that raw material is received on one side and the finished product is removed from the other.

3.6 THE INFLUENCE OF VARIOUS METHODS OF DRYING ON PRESERVATION OF THE INNATE PROPERTIES OF FISH

Voskresenskii, N. A.; Makarova, T. I.; and Martem'yanova, K. V.
Trudy Vsesoyuz. Nauch. -Issledovatel. Inst. Morsk. Rybn. Khoz. i Okeanog. 29, 69-83 (1954)
Chemical Abstracts 52, 2296 (February 10, 1958)

The innate properties of fish dried in vacuo are not preserved in full. A partial denaturation of albumin takes place. Nutritional properties of fish dried in this way differ little from those of fish dried by the cold-atmosphere method. Fish dried with heat undergo severe changes, and the final product becomes unsuitable for eating.

3.6 SOME OBSERVATIONS ON THE MODIFICATION OF FREEZE DEHYDRATED MEAT

Hamdy, M. K.; Cahill, V. R.; and Deatherage, F. E. (The Ohio State University, Columbus)
Food Research 24, 79-90 (January-February 1959)

The studies to be reported here were directed to an improvement in the texture and toughness of cooked reconstituted freeze-dehydrated meat. Since the rehydrated meat tends to be tough and woody upon cooking, it was thought that modification of meat through vascular infusion of various salts to improve the water-holding properties of the muscle protein prior to freeze-dehydration might be carried over to the cooked rehydrated meat and thereby improve the acceptability of the product. In order to evaluate the effect of modification of the meat it was also necessary to study, in some detail, the relationship of post-mortem aging and of cooking prior to freeze-dehydration to the quality of the meat as eaten.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Biochemistry
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Biochemistry and Physiology
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
Federation Proceedings
Feed Bag
Feedstuffs
Fish Boat
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Preservation Quarterly
Food Processing
Food Research
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Canner/Packer
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are generally omitted.

4.21 THE OIL EXTRACTED FROM HALF-DRIED SAURIES (COLOLABIS SAIRA)

Shimooka, Tsutomu and Toyama, Yoshiyuki (Nagoya Univ.)
Abura Kagaku 7, 28-30 (1958)
Eng. Nagoya Univ. 9, 360-5 (1957) (In English)
Chemical Abstracts 52, 11445 (July 10, 1958)

Peroxide number varied from 10.9 to 62.4 meq./kg.

4.21 POLAROGRAPHIC STUDIES ON RANCID FISH OIL II.

Kikuchi, Takeaki and Okada, Ikunoshuke (Tokyo Inst. Fisheries)
Nippon Suisan Gakkaishi 22, 784-6 (1956-57)
Chemical Abstracts 52, 13290 (August 10, 1958)

4.21 CHEMICAL ESSENTIALS TO THE DISCOLORATION OF FISH OIL

Nonaka, Junsaka
J. Tokyo Univ. Fisheries 43, 127-65 (1957) (In English)
Chemical Abstracts 52, 21171g (November 25, 1958)

4.29 FATTY ALCOHOL ESTERS

Rizzo, Joseph W. (Oceanside, New York)
U. S. Patent 2,801,934 (Aug. 6, 1957)

4.29 POLYVINYL ESTER RESIN PLASTICIZED WITH AN EPOXY STEARIC ACID ESTER

Sprules, Francis J.; Marks, Henry C. (Glen Ridge New Jersey)
U. S. Patent 2,802,800 (Aug. 13, 1957)

4.29 INHIBITION OF CELL DIVISION BY ULTRAVIOLET-IRRADIATED UNSATURATED ACID

Wilbur, K. M.; Wolfson, Nancy; Kenaston, Carolyn B.; Ottolenghi, A.; Gaulden, Mary Esther; and Bernheim, F. (Duke Univ., Marine Lab., Beaufort, N. C.)
Exptl. Cell Research 13, 503-9 (1957)
Chemical Abstracts 52, 18562 (November 10, 1958)

Aqueous extracts of ultraviolet-irradiated methyl linolenate inhibited cleavage, reversed furrow formation, and reduced spindle size, of the annelid (Chaetopterus pergamentaceus).

4.29 SULFATED FATTY UREA N-GLYCOSIDES

Erickson, John G. (Minneapolis, Minnesota)
U. S. Patent 2,808,404 (Oct. 1, 1957)

4.29 CONDENSATION OF MALEIC ESTERS AND FATTY ESTERS

Harrison, Stuart A. (Minneapolis, Minnesota)
U. S. Patent 2,808,418 (Oct. 1, 1957)

4.29 MODIFICATION OF FATTY TRIGLYCERIDES WITH TITANIUM ALKOXIDE CATALYSTS

Brokaw, George Y. (Rochester, New York)
U. S. Patent 2,808,419 (Oct. 1, 1957)

4.29 METHOD FOR PREPARING MIXED TRIGLYCERIDE COMPOSITIONS

Brokaw, George Y. (Rochester, New York)
U. S. Patent 2,808,421 (Oct. 1, 1957)

6.15 HOMOGENATION OF FISH PRODUCTS

Bedford, Robert H.
U. S. Patent 2,851,356 (Sept. 9, 1958)
Chemical Abstracts 53, 608g (January 10, 1959)

Ca compounds are used to aid in producing homogeneously dispersed fish organic matter in aqueous solution. If the process is performed before concentration, the stickwater is acidified to pH 4.4 with H_2SO_4 and heated to 90° to precipitate the insoluble substances. The mixture is centrifuged to give supernatant stickwater containing 6 percent total solids. This stickwater is treated with 0.05 to 0.1 percent $Ca(OH)_2$ by weight or the equivalent amount of Ca as $CaCl_2$, $CaCO_3$, $Ca(OAc)_2$, or Ca lactate. The mixture is then concentrated to 50-percent total solids.

6.15 ANIMAL-FEED EMULSIONS

Bedford, Robert H.
U. S. Patent 2,851,357 (Sept. 9, 1958)
Chemical Abstracts 53, 610e (January 10, 1959)

Different fats are used to form emulsions with "fish stickwater", which prevent dustiness of the feed, maintain fluidity at low temperatures, provide nutritional properties, and protect against atmosphere oxidation. Some of the emulsifying agents used are crude fish oil, soybean oil, cottonseed oil, coconut fat, acidulated corn or soybean roots, and their mixtures. Compounds containing Ca^{++} are added to stabilize the homogenous dispersion of organic matter in the concentrate. The proportion of fats may be varied, but solid fats can be used only when dissolved in a liquid fat or fatty acid.

INDEX

Subject	Page No.	Card No.
Analysis, organic		
Marine sterol from starfish	25	7.594
Separation of whale oil alcohols	25	7.594
Byproducts, miscellaneous		
Animal food industry	15	6.52
Fish scale bioassay	15	6.84
Canned fish, processing		
Thermal processing of ham	21	3.337
Heat conductivity of mackerel	21	3.337
Chemistry and biochemistry, miscellaneous		
Nonenzymic browning	1	0.33
Greening of tuna	1	0.33
Alginase in sea urchin	1	0.38
Biochemical changes in proteins	17	0.321
Behaviour of squid myosins	17	0.322
N-Glucosides of amino acids	17	0.33
Nonenzymatic browning	17	0.33
Glycylglycine dipeptidase	17	0.38
Metal ions effect glycylglycine	17	0.38
Composition, organic		
Salmon blood nucleotides	11	8.59
C_{16} menhaden fatty acids	13	4.13
Crustacean amino acids	25	8.51
Protein-splitting enzyme of fish flesh	25	8.51
Composition, vitamins		
Vitamin B_{12} in marine fish	15	8.64
Dried and dehydrated fish		
Modified freeze-dried beef	21	3.6
Drying affects fish quality	21	3.6
Factoryships		
Freezing fish at sea	5	2.118
Fish meal, nutritive value		
Tyrosine in fish materials	15	6.195
Fish meal and oil, manufacture		
Fish meal manufacture	13	6.131
Covering stacks of meal	13	6.14
Storage of concentrate	13	6.14
Stickwater treatment with fats	23	6.15
Stickwater treatment with calcium	23	6.15
Fish-hatchery food from anchovies	25	6.51
Frozen fish, changes in during freezing and cold storage		
Changes in frozen fish	9	3.239
Storage of frozen food	11	3.249
Effect of storage temperature	11	3.2497
Histamine formation in muscle	19	3.239
Storage of frozen whale meat	21	3.2497
Thaw indicator	21	3.2497
Frozen fish, processing		
Removal of blood from fish	5	2.3

Subject	Page No.	Card No.
Gear, fishing		
Flying depth recorder	3	2.116
Bloodworms for surf casting	5	2.1127
Effect of net color	19	2.111
Effect of vinyl net color	19	2.111
Fish finder logs swim speed	19	2.116
Sea clutter echoes on radar	19	2.116
Handling fresh fish		
Spray brining of fillets	3	2.3
Marine plant products		
Third international seaweed symposium	7	6.32
Composition of Chlorella pyrenoidosa	9	6.32
Alginate mucilages	25	6.34
Alginic acid residues	25	6.34
Nutritional value of fish and toxicity		
Shellfish toxicity vs. weather	5	2.9
Nutritional value of fishery byproducts other than meal		
Vitamin requirements of salmon	25	6.51
Oils, chemical and physical proporties		
Saury oil	23	4.21
Discoloration of fish oil	23	4.21
Studies of rancid fish oil	23	4.21
Condensation of maleic and fatty esters	23	4.29
Epoxy stearic acid ester as plasticizer	23	4.29
Fatty alcohol esters	23	4.29
Irradiation of fatty acids	23	4.29
Modification of oil	23	4.29
Sulfated fatty urea N-glucosides	23	4.29
Mixed triglycerides	23	4.29
Preservatives and sanitation		
Sea water holding of lingcod	7	3.12
Antibiotics for spoilage control	7	3.12
Chemical preservation of foods	7	3.12
Antibiotic ice	9	3.17
Fish plant odor control	9	3.18
Chlortetracycline residue in fish	19	3.12
Antibiotics as tuna preservatives	19	3.12
Salt fish		
Salt fish research	11	3.5
Shrimp		
Shrimp industry of the U. S.	17	1.85
Smoked fish		
Vitamins B_1 and B_{12}	21	3.4
Fish sausage	21	3.4
Fish smoking factory	21	3.4
Tuna		
Australian tuna	1	1.017
Vessels, fishing		
Holding tank construction	3	2.117
Hydraulic lift deck	3	2.117

6.34 THE PRESENCE OF L-GULURONIC ACID RESIDUES IN ALGINIC ACID

Drummond, D. W.; Hirst, E. L.; and Percival, Elizabeth (Chemistry Department, The University, Edinburgh, Scotland)
Chemistry and Industry No. 33, 1088-1090 (August 16, 1958)

6.34 THE INFLUENCE OF VARIOUS PHYSICOCHEMICAL FACTORS ON THE VISCOSITY OF ALGINATE MUCILAGES

Bollinger, Rosemarie and Munzel, K. (F. Hoffmann-La Roche & Co., A.-G., Basel, Switz.)
Pharm. Acta Helv. 33, 225-48 (1958)
Chemical Abstracts 52, 20883a (November 25, 1958)

The apparent viscosity values of the mucilages with the same proportional contents of Na alginate rise with the degree of polymerization. There is a sharp rise of the apparent viscosity values with small increases in the concentration of Na alginate; a maximum viscosity is obtained in a mucilage containing 1.2 percent of Manucol SS/LM, a common product of Na alginate, which was adjusted to several pH values.

6.51 FISH-HATCHERY FOOD FROM ANCHOVIES CAUGHT NEAR SANTA BARBARA, CALIFORNIA

Sanford, F. Bruce (Fishery Technological Laboratory, U. S. Fish and Wildlife Service, Seattle, Washington)
Commercial Fisheries Review 19, 16-19 (February 1957)

6.51 (Cross Reference: 9.14)

WATER-SOLUBLE VITAMIN REQUIREMENTS OF SILVER SALMON

Coates, John A. and Halver, John E. (Western Fish Nutrition Laboratory, Cook, Washington)
Special Scientific Report: Fisheries No. 281, 9 pp. (November 1958) (United States Department of the Interior, Fish and Wildlife Service, Washington 25, D. C.)

Qualitative vitamin requirements of silver salmon (Oncorhynchus kisutch) were determined by feeding groups of fingerlings a complete vitamin test diet (casein 54, gelatin 15, corn oil 7, cod-liver oil 2, dextrin 8, minerals 4, methionine 1.0, tryptophan 0.5, and celluflour plus crystalline vitamins 8.5) as the control diet and deleting one water-soluble vitamin at a time from the ration for the respective deficient lots. A 16-week feeding period resulted in vitamin-deficiency syndromes appearing in thiamine, pyridoxine, folic acid, biotin, pantothenic acid, inositol, and choline deficient groups. Nicotinic acid, riboflavin, and cyanocobalamine deficient lots gave inconclusive results, and under experimental conditions used, no deficiency syndromes were observed for fish without ascorbic acid in the diet.

7.594 SEPARATION OF HIGHER ALCOHOLS FROM SPERM HEAD AND BLUBBER OILS WITH LIQUID AMMONIA

Itai, Ichiro (Nippon Suisan Co., Tokyo)
Repts. Research Lab. Nippon Suisan Co. 7, 97-101 (1956)
Chemical Abstracts 50, 8233 (May 25, 1956)

7.594 MARINE STEROLS. V. ISOLATION OF 7,24(28)-ERGOSTADIEN-3β-OL FROM STARFISH

Fagerlund, U. H. M. and Idler, D. R. (Fisheries Technological Station, Vancouver, B. C.)
Journal of the American Chemical Society 81, 401-403 (January 20, 1959)

A new sterol, 7,24(28)-ergostadien-3β-ol, has been isolated by a chromatographic separation of the azoyl esters prepared from the sterols of the starfish, Pisaster ochraceus. Starfish sterols contained 19 percent of this sterol.

8.51 AMINO ACID COMPOSITION OF CRUSTACEAN MUSCLE PROTEINS

Konosu, Shoji; Katori, Shin-ichi; Akiyama, Teruko; and Mori, Takajiro
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 4, 300-304 (1958) (English abstract, tables, and figures)

Eighteen amino acids in proteins that were prepared from the muscles of three species of crustacea were determined by the ion-exchange column chromatographic method. The content of glycine, alanine, leucine, tyrosine, and phenylalanine of crustacean muscle proteins was almost at the same level as those of the ordinary muscle proteins of fish. Crustacean muscle showed a higher value of the acidic amino acids--glutamic and aspartic acids--and a lower value of valine, isoleucine, threonine, and lysine as compared with the fish muscle. The muscle protein of the blue crab contained 1.61 percent of tryptophan.

8.51 PROTEIN-SPLITTING ACTIVITY OF FISH FLESH

Siebert, G. (Univ. Mainz. Ger.)
Experientia 14, 65-6 (1958) (In German)
Chemical Abstracts 52, 14010 (August 25, 1958)

Fish-muscle extracts contained neither proteinases with a pH optimum near 7.0 nor carboxylases for glutamic and aspartic acids. Glycylglycine dipeptidase activity was found to be at the upper limit of values obtained with mammalian tissues.

United States
Department of the Interior
Fish and Wildlife Service
Washington 25, D. C.

Official Business